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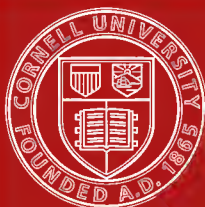
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Universal Safety Standards

A Reference Book of Rules, Drawings, Tables,
Formulae, Data and Suggestions for Use of
Architects, Engineers, Superintendents,
Foremen, Inspectors, Mechanics
and Students

by

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Consulting Safety Engineer

Member American Society Mechanical Engineers

Compiled under the Direction of
and Approved by
the
Workmen's Compensation
Service Bureau
New York.

Second Edition, Revised and Enlarged
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1914

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by

CARL M. HANSEN

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DEDICATION

TO employers and employees jointly this volume is dedicated, in the full realization that only by the constant co-operation of both can economic waste and needless sacrifice of human life and limb caused by work accidents be obliterated and the goal of the Workmen's Compensation Service Bureau, "Universal Safety," be attained.

PREFACE

WHEN the first edition of "Universal Safety Standards" was published in November, 1913, the demand immediately became sufficient to warrant the speedy publishing of two extra editions, bringing the total up to 40,000 copies. In view of the strictly general nature of those Standards, the Workmen's Compensation Service Bureau instructed the author to proceed with the compilation of a larger edition dealing also with specific industries.

In the preparation of this volume, it has been the aim to present in a manner suitable for ready reference, both the subject of safety in general, and the subject of safety on working machines and appliances in machine shops, metal working shops, and foundries particularly. It was appreciated that the mere statement that a given hazard on a machine should be guarded was more or less academic, unless it be also shown conclusively by drawings how such a machine might be guarded. Accordingly plates were prepared of practically all types of machines found in these industries, showing guards applied to the parts creating a work accident hazard.

Criticism may be made that too much stress is laid upon the mechanical hazard and too little attention given to the human element. The author desires to state emphatically that he least of all underestimates the human equation in accident prevention, but he wishes also to emphasize the fundamental fact that so far as the mechanical equipment constitutes the immediate cause of a given accident, such accident would not happen even though the exciting cause in the form of a careless workman were introduced if the particular mechanical equipment were safeguarded. This, he

hopes, will dispel in the minds of students of accident prevention, the idea that any desire to minimize the human equation, as a factor in causes of accidents, is entertained.

The subject treated being a comparatively new one, and very little available data being in existence, this treatise as a whole is naturally incomplete. In fact, it deals with a subject which never can be finally disposed of, and must be added to continually on account of the introduction of new machines and processes.

It has been our desire to cover the field solely from an engineering standpoint, without entering into any academic discussion as to the value of, or the reason for, any given guard displayed. The obviousness of a hazard capable of producing an accident under given circumstances has been our guide and rule for the elimination of that hazard, irrespective of any statistical data of whether or not an accident ever occurred from that cause.

Manifestly a subject of this nature could not be treated successfully by one individual, consequently the author has availed himself of the advice and counsel of numerous prominent authorities on this phase of our industrial development. To the following corporations, individuals and organizations whose help has made this work possible, he extends his grateful acknowledgment: Aetna Life Insurance Company, American Indemnity Company, Casualty Company of America, The Employers Liability Assurance Corporation, The Fidelity and Casualty Company, Fidelity and Deposit Company, Frankfort General Insurance Company, Globe Indemnity Company, Guardian Casualty and Guaranty Company, London Guarantee & Accident Company, Maryland Casualty Company, Massachusetts Bonding and Insurance Company, New Amsterdam Casualty Company, New England Casualty Company, Ocean Accident and

Guarantee Corp., Royal Indemnity Company, Standard Accident Insurance Company, The Travelers Insurance Company, United States Casualty Company, United States Fidelity & Guaranty Company, constituting the Workmen's Compensation Service Bureau; General Electric Company, International Harvester Company, Norton Company, United States Steel Corporation and subsidiaries; to Mr. Theo. E. Gaty, Secretary, Fidelity and Casualty Company; Mr. Charles H. Holland, General Manager, Royal Indemnity Company; Mr. J. J. Murray, General Superintendent, The Employers Liability Assurance Corp.; Mr. J. Scofield Rowe, Vice-President, Aetna Life Insurance Company; Mr. J. H. Thom, General Superintendent, Standard Accident Insurance Company; Mr. A. W. Whitney, General Manager, Workmen's Compensation Service Bureau, constituting the Classification and Rating Committee of the Workmen's Compensation Service Bureau under whose direction the work has been compiled; to Mr. C. A. Austrom, Assistant Chief Engineer, The Travelers Insurance Company; Mr. J. C. Barden, Associate Director, Bureau of Accident Prevention, Aetna Life Insurance Company; Mr. Charles Nelson, Chief Engineer, Royal Indemnity Company; Mr. J. W. Rausch, Chief Engineer, Maryland Casualty Company, constituting the Special Committee of Safety Engineers of the Classification and Rating Committee; to Mr. C. L. Close, Manager, Bureau Safety and Relief, United States Steel Corporation; Mr. David Van Schaak, Director, Bureau of Accident Prevention, Aetna Life Insurance Company; Mr. R. J. Young, Manager, Safety and Relief, Illinois Steel Company; Mr. Byron Cummings, Mechanical Engineer, Ocean Accident and Guarantee Corp. and Mr. A. C. Carruthers, Manager, Safety Engineering Magazine.

Grateful acknowledgment is also accorded the following organizations from which matter relating to the

subject has been obtained, part of which has been used: Industrial Commission of Wisconsin, National Association of Manufacturers, National Council for Industrial Safety, National Founders Association and the National Metal Trades Association.

In addition, grateful acknowledgment is accorded all the Engineers of the Workmen's Compensation Service Bureau for their untiring effort in making this volume represent the ideal in accident prevention from an engineering standpoint and for their many and practical suggestions.

The term "Standard" as used herein should not be misunderstood. The word which would more properly convey the ideas and objects of this publication is "Principle." What we are indicating in most of our drawings are principles which must be worked out in detail to fit the particular equipment or plant under consideration.

C. M. H.

New York, September, 1914.

ANNOUNCEMENT

THE WORKMEN'S COMPENSATION SERVICE BUREAU has entered into an affiliation with the Underwriters Laboratories, Incorporated, by which, under the direction of a council of technical experts of that Bureau, the Laboratories will make inspections of machines, appliances and devices and other proprietary articles as regards their safety to life.

This will amplify the already important work which the Laboratories are doing in the field of safety to property as regards fire. When this arrangement is completed, the label of the Underwriters Laboratories will mean that an article has been inspected for safety to life as well as to property.

The word "approved" as used in this handbook signifies the approval only of the PRINCIPLE mentioned or illustrated.

The label of the Underwriters Laboratories will, on the other hand, be the medium through which the Bureau will express its approval of any SPECIFIC ARTICLE, and, on the basis of such approval, recognize it in its system of Schedule or Merit Rating under the "Universal Analytic Schedule."

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PART I.

GENERAL SAFETY STANDARDS

GENERAL SAFETY STANDARDS

Buildings

Height

(a) Height not to exceed four (4) stories.

(b) A basement five (5) feet or more above ground level, on any side to be counted as a story. (See Page 39.)

NOTE—Limiting height to four (4) stories is simply to indicate that compensation insurance rate will increase in direct proportion to additional floors.

Construction

(a) To be fireproof or slow-burning.

Fireproof construction—building with fireproof, non-combustible walls, roofs and floor.

Slow-burning or mill construction—building with stone, concrete or brick walls, and floors of not less than two (2) inch planks, with hard wood top floors on beams (without joists) or posts.

NOTE—National Board of Fire Underwriters' specifications for detail of construction are accepted.

Protection Against Fire Hazard

(a) All buildings to be equipped with efficient and ample fire fighting appliances such as hose and/or fire pails and/or chemical extinguishers and/or sprinkler systems. Apparatus of this nature bearing the label of the Underwriters' Laboratories will be accepted.

(b) All buildings to have sufficient exits and fire escapes as follows:

1. At least two (2) exits completely separated and each enclosed in fire walls (stairs and elevator in the same shaft or near together to be considered one exit unless separated by fire wall.) (See Pages 40, 41, 42, 43, 44, 45, 46, 47.)

2. All exit doors to open outward. (A sliding door may be used if door runs in boxing.)
3. Exits to fire escapes to be kept unlocked at all times when employees are in building, and aisles leading to exits to be kept clear at all times.
4. Exits to be plainly marked with white letters on green field. (See Pages 42, 109.)
5. Landings on fire escapes to be level with floor, and sill of exit not to exceed two (2) inches in height. (See Pages 46, 47.)
6. Where fire escapes border windows, glass to be wire glass in metal frames. (See Pages 46, 47.)
7. All buildings of more than four (4) stories in height to be provided with fire resisting and smoke-proof towers. (See Pages 41, 43, 44.)
8. Where a building is divided into two (2) or more separate departments or sections by fire walls running vertically from cellar floor to roof, sliding fireproof doors to be provided in such wall or walls on each floor, and doors to be kept unlocked at all times when any employees are in building. Windows bordering fire wall on both sides to be wire glass set in metal frames. Fire escapes to be provided direct from each such department or section. (See Pages 40, 41, 42.)
9. Where bridges or runways are provided from one building to another and such bridges or runways are of fire resisting construction, they may be used as a fire escape from floors connected provided there be proper exit from the other building. (See Page 45.)
10. No awnings are to be permitted on exits to fire escapes nor on windows bordering on fire escapes.

(c) Every building more than one (1) story in height, to be equipped with efficient means of giving alarm of fire to employees.

(d) Where building is more than one (1) story in height, fire drills to be practiced at frequent and irregular intervals not less than once monthly.

Stairs

Any flight of steps having more than three (3) risers.

(a) To have approved slip-proof treads in good condition, firmly secured and with no protruding bolts, screws or nails.

(b) To be free from winders.

(c) To have landings located twelve (12) feet or less apart measured in a vertical direction, both dimensions of such landings to be equal to or greater than the width of stairways between handrails (or handrail and wall.)

(d) Landings to be level and free from intermediate steps between the main up flight and the main down flight.

(e) All treads to be equal and all risers to be equal in any one flight.

(f) The sum of one tread and one riser, exclusive of nosing, to be not more than eighteen (18) inches nor less than seventeen (17) inches. (See Table, Page 48.)

(g) Angle of stairs with horizontal to be not more than fifty (50) degrees nor less than twenty (20) degrees. (See Page 48.)

(h) Nosing not to exceed one and one-quarter ($1\frac{1}{4}$) inches.

(i) To be equipped with permanent and substantial hand rails thirty-six (36) inches in height from center of tread, as follows :

1. On all open sides. (See Page 49.)
2. On one side of enclosed stairway four (4) feet or less in width. (See Page 50.)
3. On both sides of enclosed stairway over four (4) feet in width. (See Page 50.)
4. On both sides and in center of stairway over eight (8) feet in width. (See Page 49.)

(j) Handrails to be constructed of pipe, iron work or wood, conforming to standards as specified under "Floor Openings," or of material and construction of equal strength.

(k) All handrails to have rounded corners and to be smooth and free from splinters.

Elevated Runways and Platforms

Any runway or platform suspended from above or supported from underneath.

(a) If four (4) feet or more from floor level, to be provided with substantial standard hand rail. (See Page 51.)

(b) If six (6) feet or more from floor level, to be provided also with toe board (for specifications see "Floor Openings "). (See Pages 51, 52.)

Floors

(a) Floors to be of sufficient strength to safely withstand a load of one hundred and twenty (120) pounds on every superficial foot, or stronger where load, concentration of load, or vibration demands.

(b) To be free from protruding nails, splinters, holes, slipperiness, unevenness, loose boards, etc.

(c) Surface of floors around power driven machinery to be kept in a slip-proof condition.

Floor Openings (Not Hoistways)

Any opening in a floor made for a specific purpose, and necessary for the conduct of the work.

(a) To be guarded with a railing not less than three and one-half ($3\frac{1}{2}$) feet high, a toe board not less than six (6) inches high and an additional railing midway between the two. Railings to be constructed in a permanent and substantial manner, of either pipe, metal work or wood, conforming to "Standard Railing" specifications. One or more sides may be on hinges or in sockets. (See Pages 53, 54.)

Standard Railings

(a) All railings to be constructed of not less than one and one-quarter ($1\frac{1}{4}$) inch standard pipe or of angle iron not less than $2 \times 2 \times \frac{1}{4}$ inches, supported on uprights of at least equal dimensions, spaced not more than eight (8) feet center, or construction of equal strength. (See Pages 55, 56.)

NOTE—Where threaded fittings are used, they are to be counter-bored sufficiently to extend at least one-quarter ($\frac{1}{4}$) inch beyond threads on pipe. (See Page 55.)

(b) Where pipe or other metal construction is found entirely impracticable, wooden railings will be accepted when complying with the following minimum requirements:

1. Top railing to be not less than 2×4 inches; center railing to be not less than 1×4 inches, of straight-grained lumber, dressed on four (4) sides, supported on 4×4 inch posts, dressed on four (4) sides, spaced not more than eight (8) feet center; or of built up construction of equal strength. Posts to be secured in approved manner. (See Page 57.)

(c) A chute or stairway opening which cannot practically be guarded as required above to be provided with a hinged cover. (See Page 54.)

Windows

(a) All windows above the first floor to be pivoted or hinged to permit cleaning from the inside. (See Pages 58, 59.)

Skylights

Any opening (horizontal or on any incline up to fifteen (15) degrees to the vertical) in a roof for the purpose of admitting light or air.

(a) To be guarded with wire mesh or constructed of wire glass, except in the case of a skylight located in a well or adjacent to building with one or more floors above, which is to be protected with a wire netting of not less than twelve (12) gauge wire and of not more than one and one-half ($1\frac{1}{2}$) inch mesh, and also constructed of wire glass. (See Page 60.)

Elevators

(a) General

1. To be equipped with speed governor arranged to actuate safety catches on car. (See Page 62.)

2. To be equipped with slack cable safety device arranged to stop machine in case cable becomes slack or breaks.

3. To be provided with approved signal system (either speaking tube, or electrically or mechanically actuated device).

4. Elevators operated by hand rope to be provided with locking device at each landing. (See Pages 63, 64.)

5. Machine to be provided with automatic limit stops.

6. Proper protection to be placed underneath overhead machinery and sheaves. (See Page 62.)

7. Elevator, machine, gears, motor, switchboard, etc., to be guarded as shown for similar equipment in these Standards.

8. Ample light to be provided at each landing.

9. Where car is to be used for freight only, a sign to that effect to be prominently displayed on car and at each landing.

10. A sign stating maximum safe lifting capacity as fixed by builders to be posted conspicuously in elevator and at each landing.

(b) Hatchway and Hatchway Entrances

1. Sides of elevator shafts to be smooth and free from protruding objects. Beams, floors, etc., forming a shear with floor of passing elevator to be bevelled and sheeted.

2. Sides of hatchways not used for entrance to be substantially enclosed to a height of six and one-half ($6\frac{1}{2}$) feet. (Where drop automatic trap doors are used, only a railing is required, except in the case of counterweight runways, which must be enclosed to ceiling).

3. Gates at entrances to shaft to be of self-closing type and substantially constructed. (If open construction is used, space between members to be not more than two (2) inches in either direction. (See Page 61.)

4. Gates to be not less than five (5) feet, six (6) inches in height (unless placed at a distance of at least twelve (12) inches from inside edge of hoistway—in which case height to be not less than three (3) feet, six (6) inches.

5. Counterweights for gates to be enclosed and bottom of enclosure sealed.

6. Door saddle to have slip-proof surface both on car and on edge of hatchway.

(c) Cars

1. Car to be provided with approved safety catches.
2. Car to be provided with automatic limit stops.
3. Car to be provided with ample light.

4. Sides of car not used for entrance, to be substantially encased, the enclosure to be not less than six and one-half ($6\frac{1}{2}$) feet high. (If open construction is used, the space between members to be not more than two (2) inches, and where enclosure borders on counterweight runways, not more than one-half ($\frac{1}{2}$) inch.)

5. Proper protection to be provided for top of car.
(See Page 61.)

NOTE—For further standards on “Elevators” see Universal Safety Standards—Mercantile Edition.”

Hoistways

Any opening in a floor, platform outside of a building, or opening giving access to a yard arm, used for the purpose of hoisting material by tackle or other means from one level to another (not including platform elevator).

(a) To be guarded according to standards for “Floor Openings.” (See Pages 19, 65.)

Elevated and Roof Tanks

(a) Proper ladders and platforms to be provided on and around each tank and its supports to permit thorough inspection of all parts. (See Pages 67, 68.)

(b) Round hoops only to be used on wooden tanks.

Boilers

(a) To be constructed in conformity with specifications adopted by the American Society of Mechanical Engineers.

(b) To be located in detached or adjoining boiler house.

A detached boiler house is one located ten (10) feet or more from any part of the main building. (See Page 69.)

An adjoining boiler house is one connected with or in close proximity to the main building, but with a brick wall intervening. (See Page 70.)

(c) Each boiler to be equipped with efficient safety valve, with no other valve or obstruction in the pipe line between the boiler and the point of discharge. The point of discharge to be so located or protected that no one passing will be scalded.

(d) Each boiler to be provided with an efficient steam gauge and water gauge. Water gauge glasses to be provided with approved guards.

(e) Where two or more boilers are connected on one steam line, approved non-return valves to be provided on each boiler in addition to regular stop valves.

(f) If blow off pipe is connected to a closed tank, the tank to be constructed to withstand boiler pressure.

(g) If blow off pipe is open to the atmosphere, outlet to be so located or protected that no one passing will be scalded.

(h) Outlets for drains from water columns, gauges and other fittings to be so located or protected that no one passing will be scalded.

(i) When a person is working in any boiler of a battery, legible danger signs to be provided and attached to all steam valves, feed valves and blow off valves of that boiler and the handles of the valves to be locked. (See Page 71.)

(j) Steam piping to be substantially supported and suitable provision made for expansion, contraction and drainage. (See Pages 72, 73.)

(k) Pits in boiler rooms to be covered or substantially guarded according to standards for "Floor Openings." (See Page 19.)

(l) Safe means of access to all valves to be provided.

(m) Safe means of escape to be provided from all parts of the boiler house, in at least two directions, and exits to be so located that it will be unnecessary to travel up or down or more than fifty (50) feet to a door opening to the outside.

(n) Boilers to be regularly inspected by a licensed Steam Boiler Inspection and Insurance Company or by approved City, County or State Boiler Inspection Departments.

(o) Stacks to be of brick, concrete, or self-supporting steel.

Steam Engines

(a) Each engine to be equipped with an efficient governor. (A device which will at all times automatically control the speed of the engine under varied load.)

(b) Valve gear to be so arranged, or other provisions made, that in event of load being removed engine will stop if governor fails to act. (A broken belt stop to be considered sufficient for slide or four-valve engines (not Corliss.) (See Page 78.)

(c) All dangerously located moving parts, such as fly-wheels, cranks, eccentrics, cross heads, tail rods, fly balls of governor, governor sheaves, etc., to be guarded in approved manner. (See Pages 74, 75, 76, 77.)

(d) Fly-wheels to be protected as follows :

1. If guard can be fifteen (15) inches or more from wheel, with a fence at least three and one-half ($3\frac{1}{2}$) feet high, and if in pit with a toe board six (6) inches high in addition. Where passage over journal is necessary for oiler, fencing to be carried over journal at the same height. (See Pages 77, 79.)

2. Where guard must be less than fifteen (15) inches from wheel, with a fencing at least six (6) feet high, the fencing to be either solid or of railing filled in with wire mesh. (See Page 79.)

(e) To be equipped with an approved independent automatic speed limit stop, with stop stations conveniently located throughout the plant. Stops to be periodically tested and record kept of such tests.

NOTE—The above standards to be considered applicable to pump engines and air compressors when the construction is such as to bring them within these requirements.

Gas Engines

(a) If engine has a gas bag regulator, the regulator to be enclosed in metal case vented to outside atmosphere.

NOTE—Fly-wheel and other dangerously moving parts to be guarded according to standards for steam engines. (See Pages 74 to 79.)

Electrical Equipment

(a) All parts of electrical equipment, appliances and devices to be installed and protected in accordance with Universal Safety Standards. (See Pages 80 to 85 and Electrical Edition.)

Power Transmission Equipment

(Not Including Direct Transmission of Power to Working Machines)

(a) All power driven gears wherever located to be completely encased, or, where that is impracticable, to have a band guard provided with side flanges extending inward beyond the root of the teeth. (See Pages 99, 100, 101.)

(b) All sprockets and silent chain drives wherever located to be completely encased.

(c) Any part of a friction clutch within seven (7) feet of the floor, to be completely and substantially housed.

(d) Belt pulleys and friction clutch pulleys located thirty-six (36) inches or less from a bearing, to be completely encased on side nearest bearing. (See Pages 96, 98.)

(e) Vertical and inclined belts, including rope drives, to be substantially guarded, as follows:

1. If guard must be less than fifteen (15) inches from belt, with a complete enclosure to a height of six (6) feet. (See Pages 96, 97.)
2. If guard can be placed with at least fifteen (15) inches clearance from the belt, with a standard railing at least three and one-half ($3\frac{1}{2}$) feet high. (See Page 97.)

NOTE—For specifications of railing see “Standard Railings”. (Page 19.)

(f) Horizontal belts, including rope drives, to be substantially guarded, as follows:

1. If upper part is less than six (6) feet from floor level or platform, to be completely enclosed on top and sides or a standard railing at least fifteen (15) inches from belt to be provided. (See Pages 92, 93, 94.)
2. Where passage between upper and lower part of the belt is necessary, standard railing to be provided and a substantial passageway, guarded on sides and top, to be constructed. Otherwise, space traversed by belt to be completely barred against passage. (See Pages 93, 94.)

3. Overhead belts with lower part seven (7) feet or less from floor level or platform, to be guarded on sides and bottom. (See Page 95.)
4. All overhead belts six (6) inches or more in width or traveling thirty (30) feet per second, or faster, which are located more than seven (7) feet from floor or platform level, to be guarded underneath. (See Pages 93, 94, 95.)

(g) Clearance between pulley and any stationary object to be in accordance with specifications on drawing. (See Page 98.)

(h) Vertical shafts to be enclosed to a height of six (6) feet from floor or platform. (See Page 101.)

(i) Horizontal shafting seven (7) feet or less from floor or platform level to be enclosed or guarded by standard railing. (See Pages 77, 86.)

(j) Dead ends of shafts seven (7) feet or less from floor or platform level to be guarded. (See Pages 77, 79.)

(k) All parts of pulleys within seven (7) feet of floor or platform level to be completely enclosed or guarded by standard railing. (See Pages 80, 81, 82, 92, 93, 94, 95.)

(l) Set screws to be of safety type. (See Pages 89, 90, 91.)

(m) Couplings and collars to be of safety type. (See Pages 86, 87, 88, 89.)

(n) Approved automatic locking device to be provided on belt shifters for tight and loose pulleys and on friction clutch levers. (See Pages 225, 226, 227.)

(o) Efficient means to be provided in each room or department for stopping simultaneously all machinery in that room or department.

NOTE—The above standards in regard to shafts and equipment of shafts apply to all main shafting, jack shafting, drive shafting and counter shafting, up to but not including belts actually driving machines.

Guards

(a) All guards to be substantially constructed. Where mesh is used, all sharp ends are to be avoided. (See Page 55.)

(b) Where mesh larger than three-eighths ($\frac{3}{8}$) inch is used to guard belts, gears, etc., a clearance of not less than five (5) inches to be provided between the guard and the part which is guarded.

(c) Where sheet metal guards are used for gears, etc., to be constructed of heavy sheet metal or properly reinforced to insure rigidity.

Ladders

Fixed Ladders

Stringers

(a) To be of steel, sizes as shown. (See Page 102.)

(b) Spliced plates to be of the same size as the stringers and double riveted. (See Page 102.)

(c) Space between stringers to be not less than fifteen (15) inches.

Rungs

(a) Rungs to be of steel and of sizes shown. (Page 102.)

(b) Rungs to be spaced uniformly not less than twelve (12) inches nor more than fifteen (15) inches center to center.

Clearances

(a) The distance from the center of the rung to the nearest permanent object back of the ladder shall be not less than eight (8) inches. No obstruction shall be less than thirty (30) inches in front of the

point of the rungs. This does not apply to the enclosure of a ladder or to a smooth wall not less than twenty (20) nor more than twenty-two (22) inches which gives the protection of an enclosure.

Hoop Guards

(a) All ladders twelve (12) feet or more in height shall be substantially guarded with hoop and band guards from a point seven (7) feet above the floor to the top. (See Pages 52, 68.)

Supports

(a) Ladders to be supported by brackets whose cross section is equal to that of the stringers, spaced not more than twelve (12) feet on centers.

Ladders to Roofs

(a) Ladders to roofs to have stringers extending three (3) feet six (6) inches above the roof and goose-necked.

(b) Rungs to be omitted above the roof.

(c) Platforms to be provided on the top of ladders where the space between the ladder and the roof is twelve (12) inches or more.

Portable Straight Ladders

Stringers

(a) Stringers to be made of spruce, Oregon fir, No. 1 long leaf yellow pine, or its equivalent, selected close-grained and free from knots. Sizes of stringers to be not less than the following:

For ladders under twelve (12) feet, the stringers to be not less than one and one-half ($1\frac{1}{2}$) inches thick, three (3) inches wide at the bottom, tapering to two and one-half ($2\frac{1}{2}$) at the top.

Twelve (12) foot to sixteen (16) foot ladders not less than one and one-half ($1\frac{1}{2}$) inches thick, three and one-half ($3\frac{1}{2}$) inches wide at bottom, tapering to two and one-half ($2\frac{1}{2}$) at top.

Sixteen (16) foot to twenty (20) foot ladders not less than one and five-eighths ($1\frac{5}{8}$) inches thick, five (5) inches wide at bottom, tapering to four (4) inches at top.

Twenty (20) to thirty (30) foot ladders not less than two (2) inches thick, four (4) inches wide at top and bottom, tapering from five and one-half ($5\frac{1}{2}$) inches in center, or trussed construction of equal strength.

(b) Stringers to be spread so that the width of the ladder at the bottom will be greater than the width at the top by an amount equal to one-half ($\frac{1}{2}$) inch per foot of length. Minimum width at bottom to be fifteen (15) inches.

NOTE Where ladders are to be used on wooden floors only, to be equipped with spiked points. Otherwise, ladders to have shoes which will automatically adjust themselves and provide a firm hold on floors irrespective of the angle at which the ladder may be placed. Ladders intended for use on overhead shafting to have hooks at the top. (See Pages 101, 104.)

Rungs

(a) Rungs to be made of oak, white ash, maple or hickory, not less than $\frac{7}{8} \times 2\frac{1}{2}$ inches, set in stringers not less than one-half ($\frac{1}{2}$) inch at bottom of rung, tapering to 0 inch at top of rung, or round, one and one-half ($1\frac{1}{2}$) inches in center, tapering to one (1) inch at each end, and inserted in one (1) inch holes in center of stringers and provision made to prevent their turning.

(b) Rung spacing to be uniform and to be not less than twelve (12) inches and not greater than fifteen (15) inches.

Portable Step Ladders

Material

(a) Stringers and steps of portable step ladders to be made of spruce, Oregon fir or long leaf yellow pine of sufficient strength to support the load for which they are designed.

(b) Steps or rungs to be spaced uniformly; to be not less than twelve (12) inches nor greater than fifteen (15) inches.

(c) Stringers to be bolted together at least every six (6) feet. (See Page 103.)

Yards

(a) Railroad grade crossings to be avoided wherever possible.

(b) Where railroad tracks or sidings enter yards or pass exits, proper danger signs, signals and detours to be provided, and where traffic demands, flagmen to be stationed. (See Page 107.)

(c) Derailing arrangements or track skidders with warning signals to be prominently displayed at both ends of any car or train of cars in yard or shop which is being loaded, unloaded or repaired. (See Pages 108, 284.)

(d) All frogs and switches to be blocked with hardwood or metal to a distance where width between rails will be at least six (6) inches in the clear.

(e) Material to be piled in an orderly and substantial manner.

Maintenance and Inspection

(a) Bearings on shafting to be of self-oiling type, or other means to be provided to obviate the necessity of an oiler exposing himself to shafting, pulleys, gears or sprockets while in motion.

(b) Chains, hooks, slings and ropes to be regularly inspected at least once every month and chains and hooks to be regularly annealed at least once every twelve (12) months, and records kept of such inspection and annealing. Records to be in the form of a metal tag attached to each chain or hook with date of purchase and last annealing stamped thereon. In addition thereto, complete records of all chains and hooks are to be kept in office. Annealing to be made under temperatures as specified by American Society for Testing Materials. (See Pages 270, 271.)

(c) No chain, wire rope or manila rope to be used for any loads exceeding those specified in table. (See Page 271.)

(d) All hooks to be constructed in conformity with specifications in table. (See Page 268.)

(e) All chains, hooks, slings and ropes to be stored in an orderly manner and to be kept free from moisture. All steel cables and slings to be kept well lubricated. (See Page 270.)

(f) Where hoisting material is exposed to excessive heat, chains are to be used exclusively.

(g) Machinery, safety appliances and all equipment to be regularly inspected at least once every week, and records to be kept of these inspections. Records to be on approved forms.

Safety Organization in Plant

Systematic accident prevention activities and education to be carried on among employees through safety committees composed of superintendents, fore-

men and employees; and literature on accident prevention embodying specific rules and regulations relating to safety in their work to be distributed among employees in language (or languages) understood by them. The following plan of organization is suggested:

(a) A safety inspector to be appointed to perform the following duties:

To have charge of details of all safety work.
To receive all reports, recommendations and suggestions.

To inspect:

1. For need of safeguards.
2. For installation of safeguards.
3. For maintenance of safeguards.
4. For use of safeguards.
5. For unsafe practices.
6. For plant cleanliness.

NOTE—In plants of \$100,000 payroll or more, the safety inspector to devote all his time to that work. In plants with less than \$100,000 payroll, he may devote part of his time to other duties.

(b) A safety committee to be appointed, to be composed of plant superintendent or his assistant (chairman), safety inspector (secretary) and three (3) or more high grade department superintendents, foremen or workmen, who shall:

1. Have general charge and supervision over safety work.
2. Pass on all controverted matters.
3. Gather all available information.
4. Establish standards for safeguards.
5. Promulgate rules for safe operations.
6. Outline educational campaign.

(c) Workmen's committees to be appointed and changed periodically, consisting of three to five workmen who shall:

1. Make inspections of all machinery and equipment.
2. Investigate accidents in their several departments.
3. Render written reports on forms provided for that purpose.

(d) Foremen—Each foreman should:

1. Enforce safety rules adopted.
2. Be held responsible for the safety of his men.
3. Investigate accidents, reporting causes and suggestions for method of preventing recurrence on forms provided for that purpose.
4. Make frequent inspections of his department.
5. Render weekly written reports on forms provided for that purpose.

(e) Meetings of foremen—held at least monthly to discuss safety matters.

(f) Each workman to be educated and interested in safety matters, including:

1. Instruction of new men.
2. Familiarizing of men with rules.
3. Interesting the men through bulletin boards, prizes, etc.
4. Discipline.

First Aid Equipment

(a) Approved first aid equipment, including medical kits, splints, stretchers, etc., to be kept in easily accessible place or places, and persons to be properly instructed to use same until expert medical help arrives. Where hazards involved and size of plant justify it, a dispensary with trained nurse to be provided.

(b) First aid equipment to be inspected by a competent authority at least once monthly.

Explosives and Dangerous Gases, Vapors and Fumes

(a) Where any explosive or otherwise dangerous materials (liquids, solids, gases, vapors or fumes) are generated, used, kept or stored, the following requirements to be observed:

1. Rooms where explosive or dangerous gases, vapors or fumes are used or generated, to be tightly enclosed and provided with an approved system of ventilation.

NOTE—If the gas or vapor is lighter than air, hoods and vents without suction fans may be sufficient, but if it is heavier than air, a suction fan to be used.

2. Joints in tanks, pipes, conveyors, valves, etc., used for storage or conveyance of explosive liquids, gases or vapors, to be kept tight.
3. Before work is done on vessels, pipes, etc., sufficient time to be given to allow gas to escape.

NOTE—Special care to be exercised before work requiring the use of heat or a flame is done. Apparatus which has contained acetylene or similar gases to be first filled with water or steam to force out the gas.

4. No open light or flame, nor any machine or equipment capable of producing a spark, to be allowed in rooms where explosives are present. Only incandescent lights to be used, and these to be of the double-globe, vapor-proof keyless type.

NOTE—Shafting and machinery likely to cause a static electric spark, to be well grounded. All switches, fuses, etc., to be placed outside of the room.

5. Danger signs to be posted on all doors leading into the room, warning against carrying open lights into the room and stating in language (or languages) understood by all employees the hazard of so doing.
6. Where large amounts of explosive liquids are used, the main supply to be stored in a tank located at least thirty (30) feet from the building and at least two (2) feet underground, a working supply to be pumped into building as needed. Supply system to be so arranged that when the pump is stopped all the liquid in the pipe will flow back into the supply tank. Where the supply is thus pumped into building, safety cans of not over five (5) gallons capacity to be used for distribution in the building itself. Systems and appliances approved by the Underwriters' Laboratories will be accepted. (See Page 106.)
7. Where it is impracticable to use a buried tank and a pump, the main supply to be stored outside of and well away from other buildings and to be kept under lock and key. Working supply in such cases to be taken into building in closed safety cans of not over five (5) gallons capacity.

8. Signs, in language (or languages) understood by all employees, prohibiting the burning of an open flame near place of storage or pump, or other apparatus containing or conveying explosives, and giving specific instructions as to safe methods of handling, to be prominently displayed.
9. Empty barrels which have contained highly explosive liquids to be stored, bung holes down, in safe places in the open air.

(b) Coal, lamp black, tow, wood dust, cork, sulphur, malt, flour, starch, celluloid, sugar, dextrin, resin, and other substances likely to be exploded by an open flame or a spark, to be safeguarded, when present in a finely divided state, by the same ventilation standards prescribed for explosive gases and vapors.

NOTE—Bins used for the collection of dust from such substances to be tightly enclosed and vented to the open air.

General Order, Light and Sanitation

(a) Aisles and passageways to be kept clear of obstructions.

(b) All spaces of less than eighteen (18) inches between machines, or between a machine and a fixed object, to be permanently and effectively barred against passage.

(c) Material to be piled in an orderly and substantial manner.

(d) Pipes, rods, etc., when piled vertically, to be secured at top and bottom to prevent sliding and to have sufficient slant to prevent falling. (See Page 235.)

(e) Substantial racks to be provided for pipes, rods, etc., when piled horizontally. (See Page 235.)

(f) Places frequented by employees to be provided with sufficient light, natural or artificial.

(g) Ample volume of air to circulate throughout rooms, either naturally or by artificial means. (Supply to be sufficient to carry off all dust and injurious vapors or gases and to provide at least 30 cubic feet of fresh air per person per minute.)

(h) Metal receptacles to be provided for oily waste and refuse. (See Page 237.)

(i) Ample and proper sanitary facilities, such as clothes lockers, washrooms, lunchrooms, lavatories, etc., to be provided for employees. Lockers to be constructed or arranged to prevent storing or piling material on top.

Signs

(a) All danger signs, whether internally or externally illuminated, to consist of legible and conspicuous white letters forming the one word "DANGER" on red field, in language (or languages) understood by all workmen.

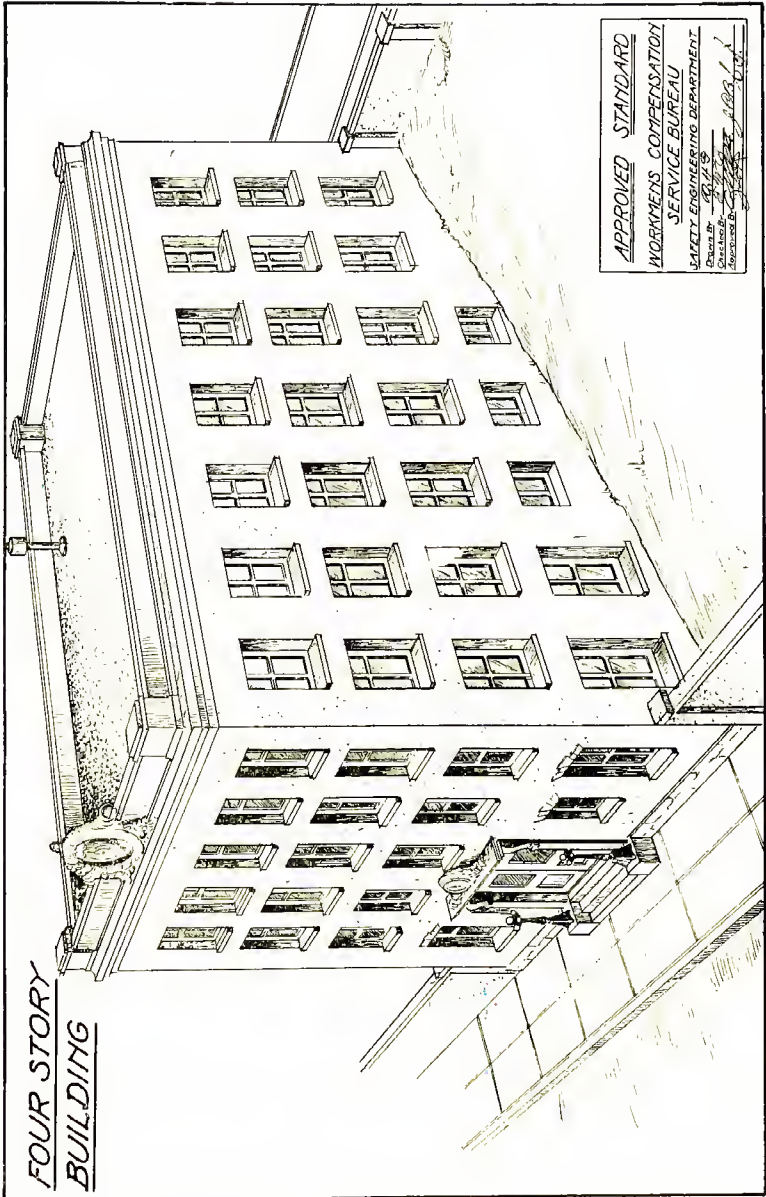
When the danger point is not obvious, a white arrow to be also displayed on the red field pointing in the direction of the danger point. (See Pages 108, 109.)

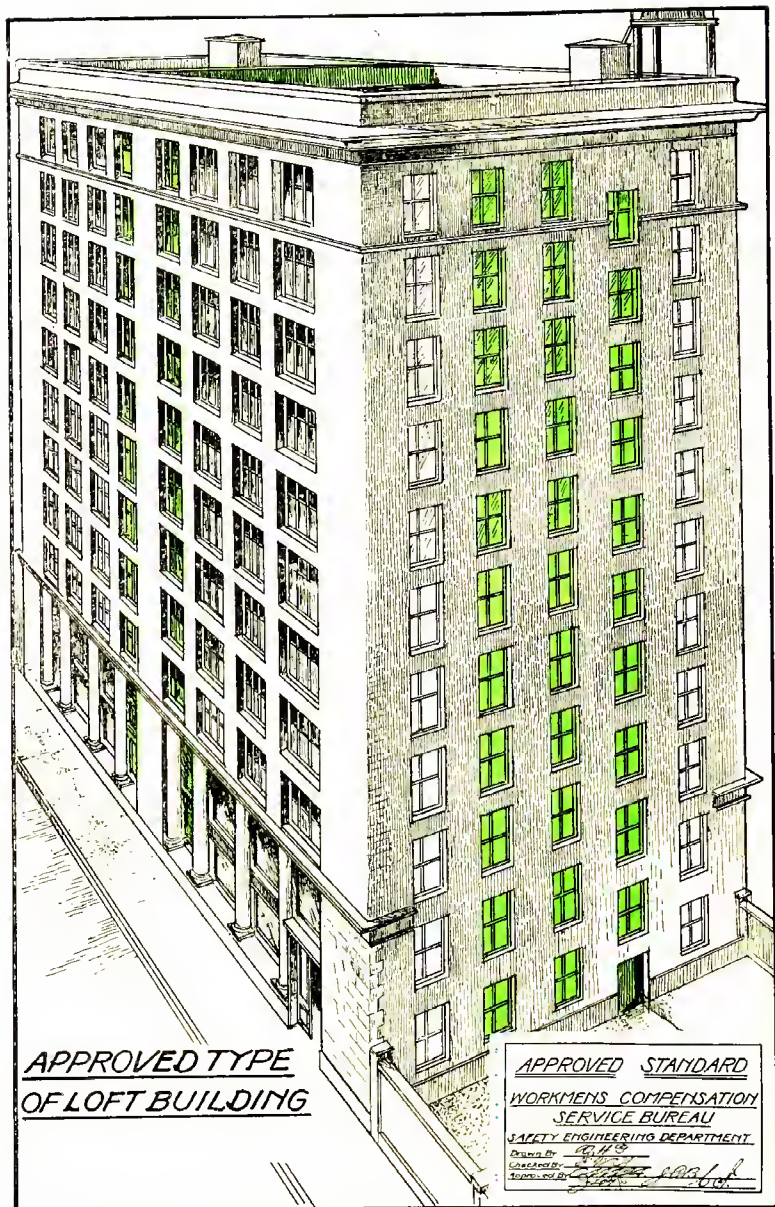
(b) All safety signs, whether internally or externally illuminated, such as for exits, first aid equipment, etc., to consist of legible and conspicuous white letters on green field, indicating the nature of the safety in as brief a form as possible. (See Pages 42, 109.)

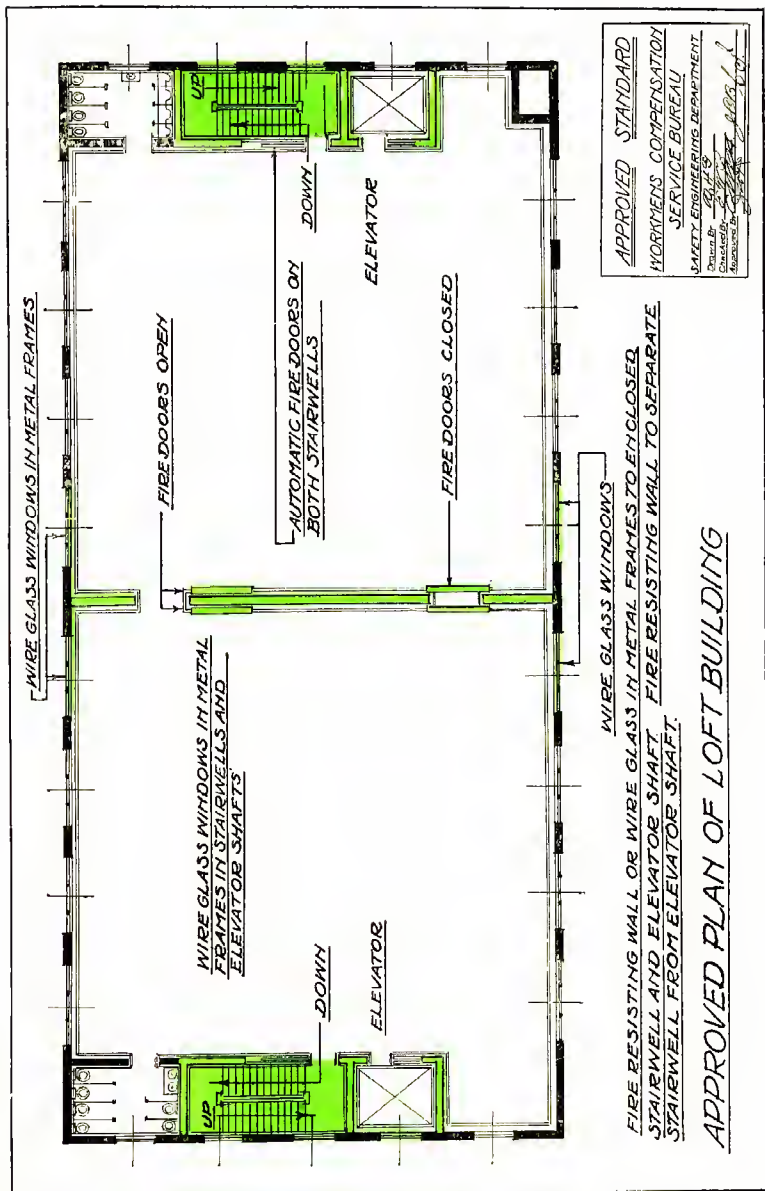
(c) All signs to be effectively illuminated, naturally or artificially.

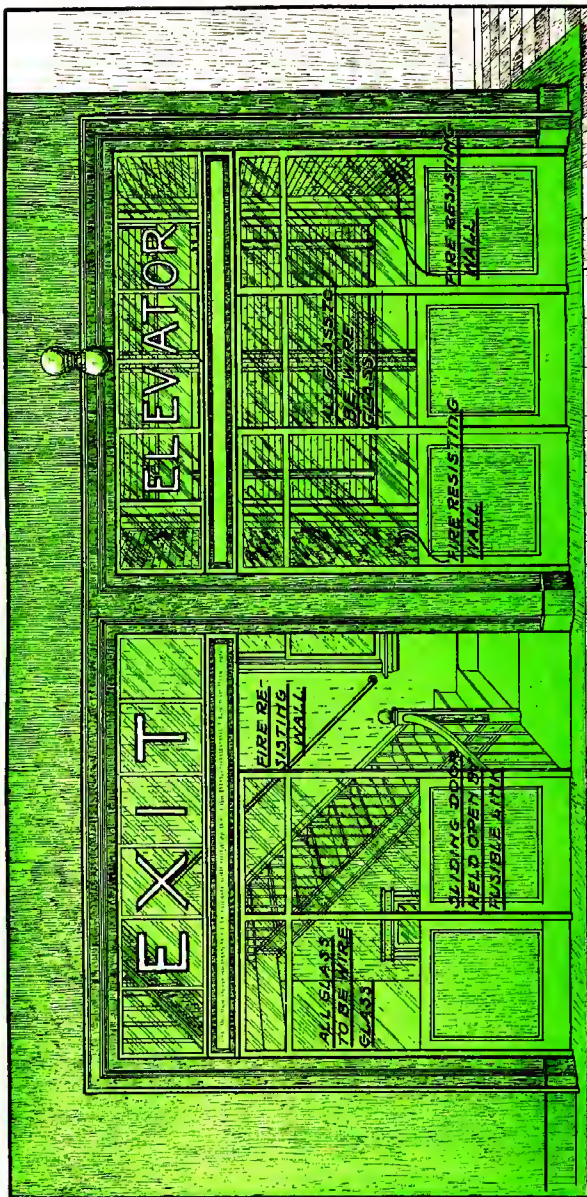
FOUR STORY
BUILDING

APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
 SAFETY ENGINEERING DEPARTMENT
 Drawn By W. J. G.
 Checked By W. J. G.
 Approved By W. J. G. 1/1/1918



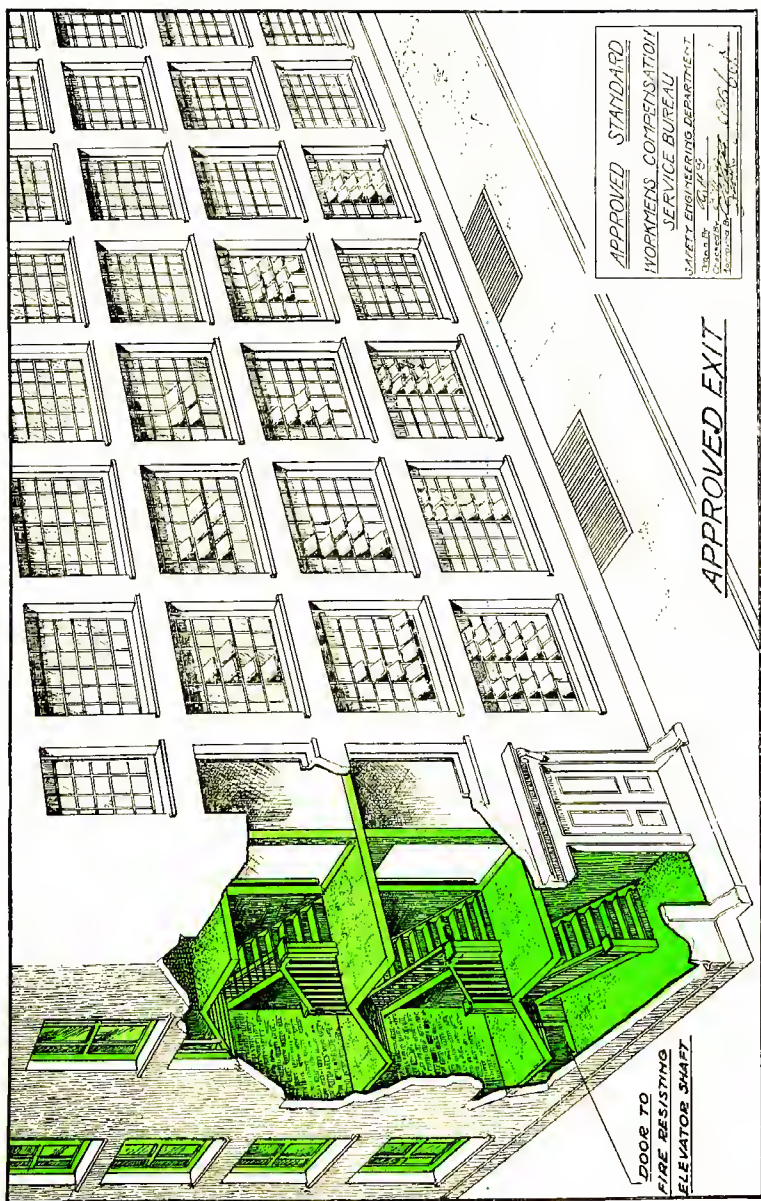


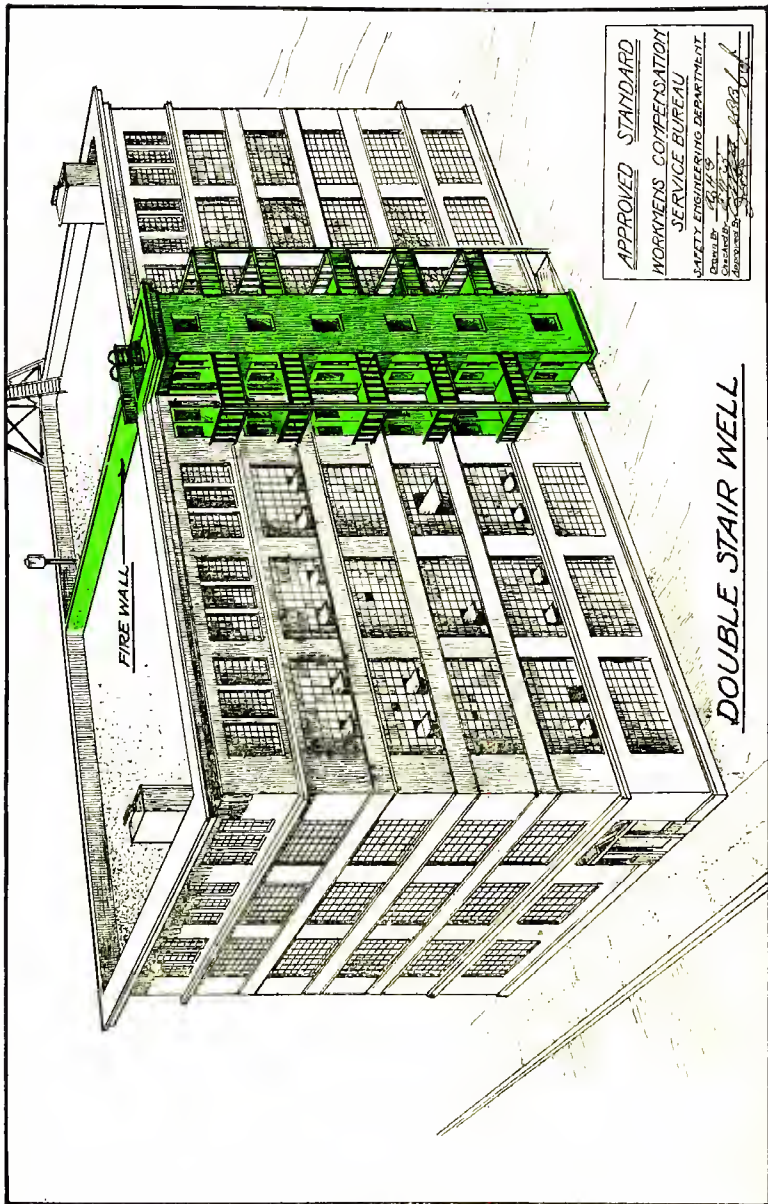




APPROVED STANDARD
 WORKMENS COMPENSATION
 SERVICE BUREAU
 SAFETY ENGINEERING DEPARTMENT
 Dated this 12th day of 1923
 Engineer *[Signature]*
 Inspector *[Signature]*

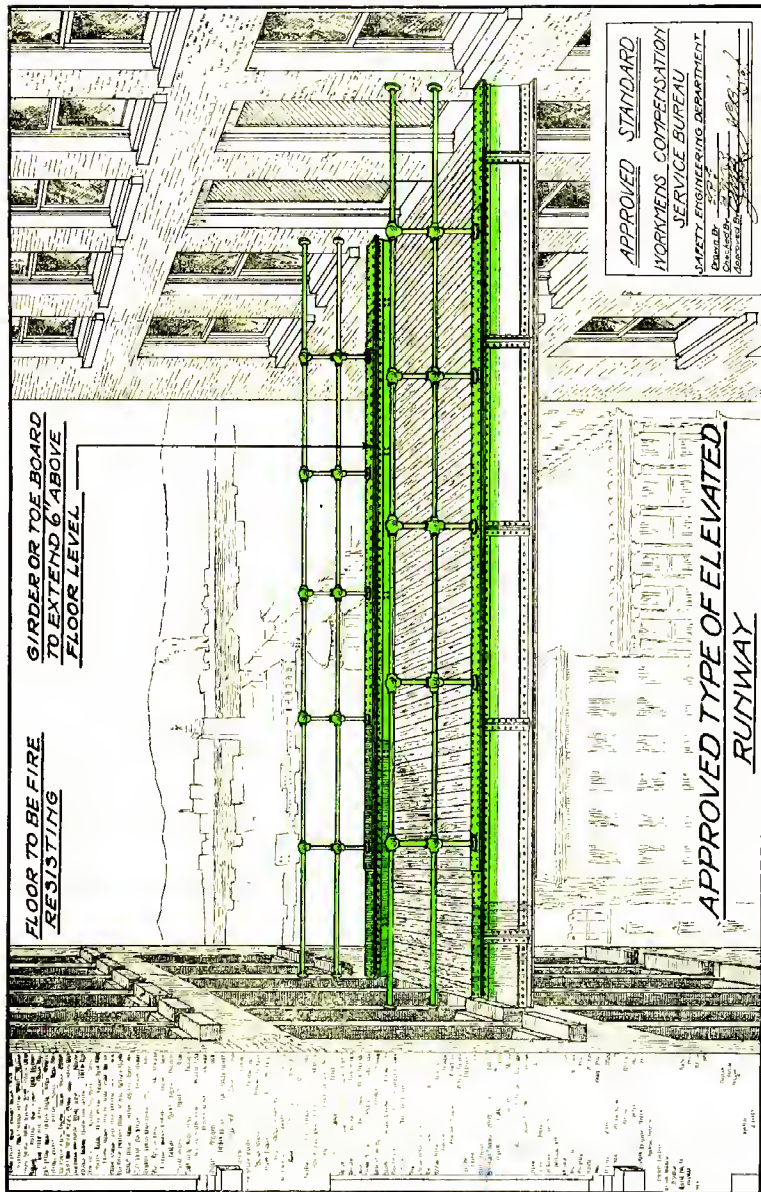
APPROVED TYPE OF EXIT





APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
 Drawn By — W. H. G.
 Checked By — W. H. G.
 Approved By — W. H. G.

DOUBLE STAIR WELL





APPROVED TYPE OF FIRE ESCAPE

ALL DOORS AND WINDOWS INDICATED IN
GREEN ARE TO BE CONSTRUCTED OF WIRE
GLASS IN FIRE RESISTING FRAMES

<u>APPROVED STANDARD</u>	
<u>WORKMEN'S COMPENSATION</u>	
<u>SERVICE BUREAU</u>	
<u>SAFETY ENGINEERING DEPARTMENT</u>	
Drawn By	<u>W. J. B. 100</u>
Checked By	<u>W. J. B. 100</u>
Approved By	<u>W. J. B. 100</u>



APPROVED TYPE OF FIRE
ESCAPE

ALL DOORS AND WINDOWS SHOWN IN GREEN
ARE TO BE CONSTRUCTED OF WIRE GLASS
IN FIRE RESISTING FRAMES

APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU

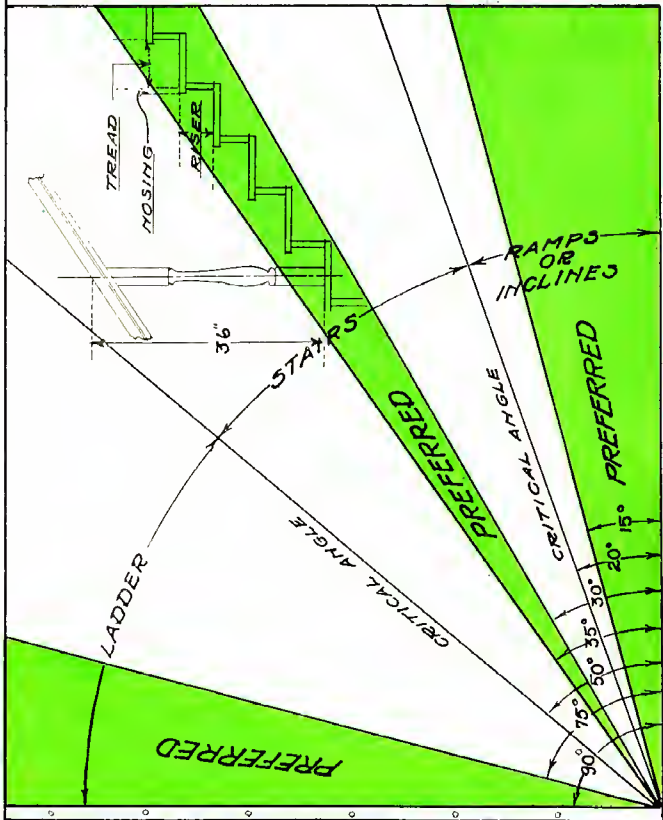
SAFETY ENGINEERING DEPARTMENT

Reviewed By: [Signature]
Checked By: [Signature]
Approved By: [Signature]

TABLE OF RISERS AND TREADS FOR STAIRS
(TREAD + RISER = 17½")

ANGLE WITH HORIZONTAL INCHES	RISER IN INCHES	TREAD IN INCHES	P.F.D.
22°-00'	5	12½	
23°-14'	5¼	12¼	
24°-38'	5½	12	
26°-00'	5¾	11¾	
27°-33'	6	11½	
29°-03'	6¼	11¼	
30°-35'	6½	11	
32°-08'	6¾	10¾	
33°-41'	7	10½	
35°-16'	7¼	10¼	
36°-52'	7½	10	
38°-29'	7¾	9¾	
40°-08'	8	9½	
41°-44'	8¼	9¼	
43°-22'	8½	9	
45°-00'	8¾	8¾	
46°-38'	9	8½	
48°-16'	9¼	8¼	
49°-54'	9½	8	

APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
Created By: [Signature]
Approved By: [Signature]



STAIRS, LADDERS AND RAMPS OR INCLINES

STAIRS WITH OPEN SIDES

LESS THAN 8 FEET
IN WIDTH

36"

36"

8 FEET OR OVER IN WIDTH

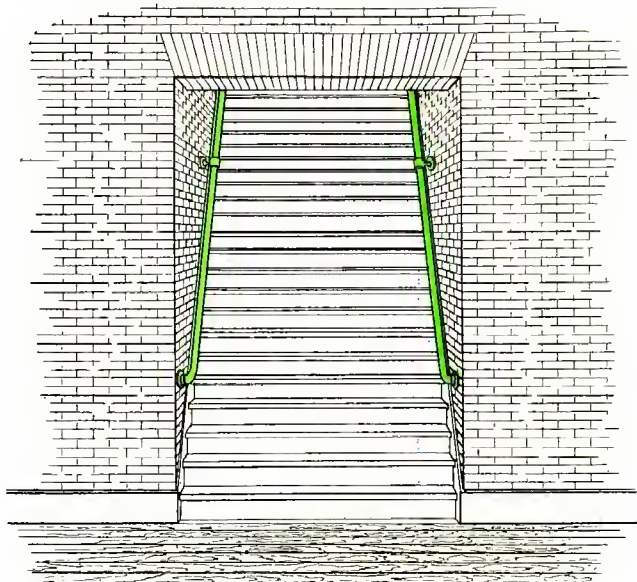
APPROVED STANDARD

WORKMENS COMPENSATION
SERVICE BUREAU

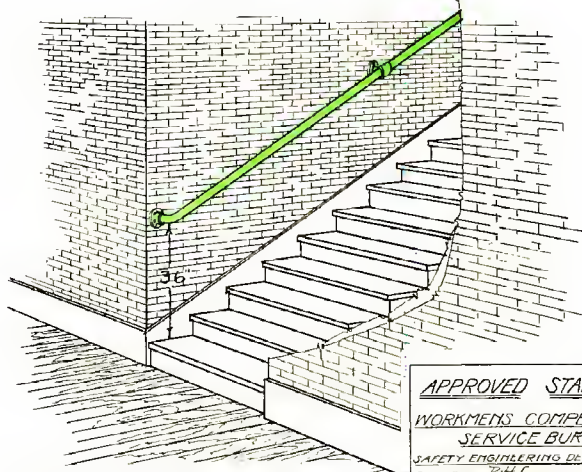
SAFETY ENGINEERING DEPARTMENT

Drawn By J. H. H. H.
Checked By J. H. H. H.
Approved By J. H. H. H.

ENCLOSED STAIRS



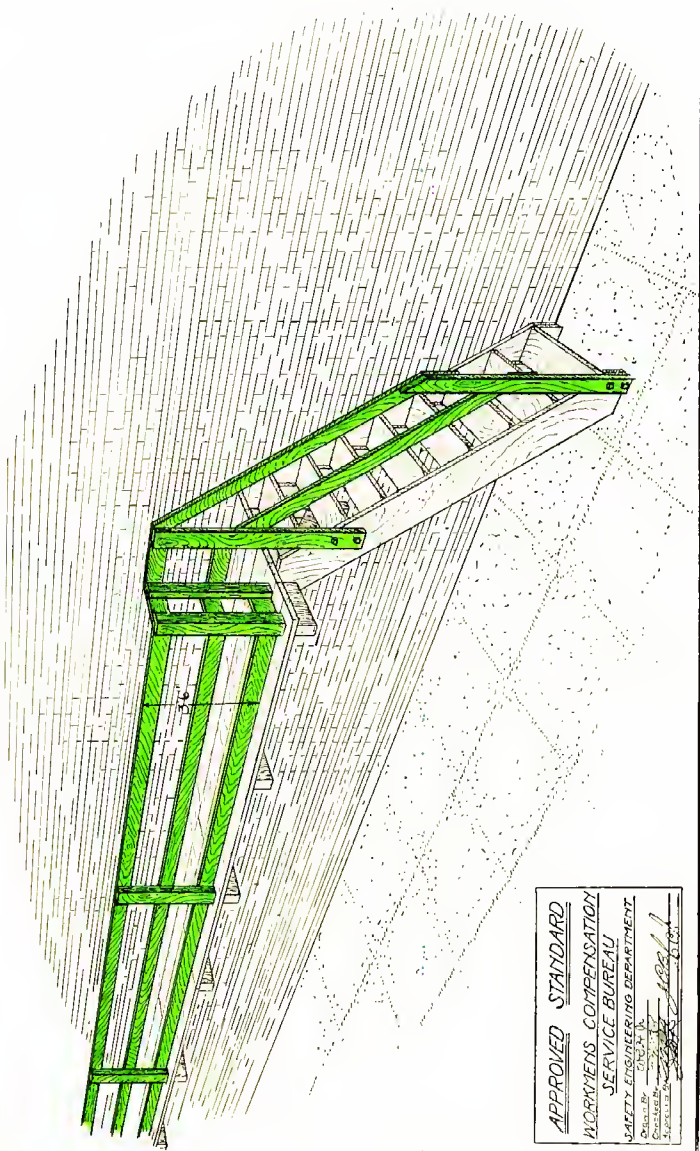
4 FEET OR OVER IN WIDTH



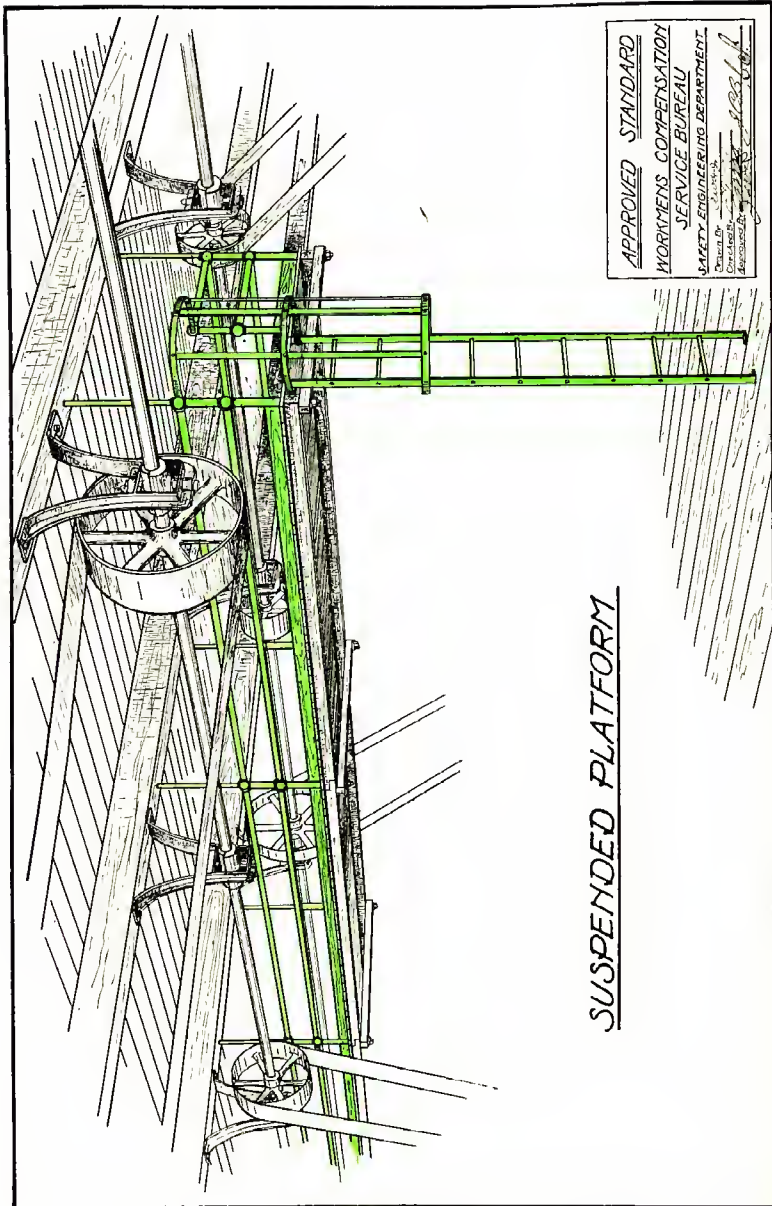
LESS THAN 4 FEET IN WIDTH

APPROVED STANDARD
WORKMEN'S COMPENSATION
SERVICE BUREAU
 SAFETY ENGINEERING DEPARTMENT
 Drawn By: P.H.
 Checked By: W.C.
 Approved By: W.C.

ELEVATED PLATFORM



APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
 SAFETY ENGINEERING DEPARTMENT
 OFFICE OF
 CHIEF ENGINEER
 SUPERVISOR
[Signature]



SUSPENDED PLATFORM

APPROVED STANDARD

WORKMENS COMPENSATION
SERVICE BUREAU

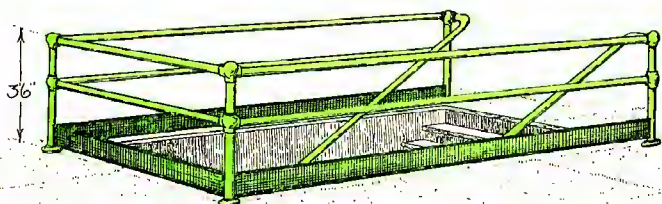
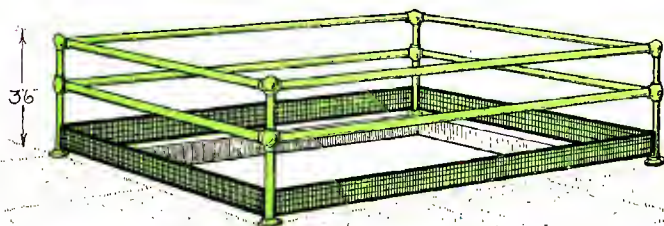
SAFETY ENGINEERING DEPARTMENT

Drawn By: A. C. 10-1-36

Checked By: J. E. 10-1-36

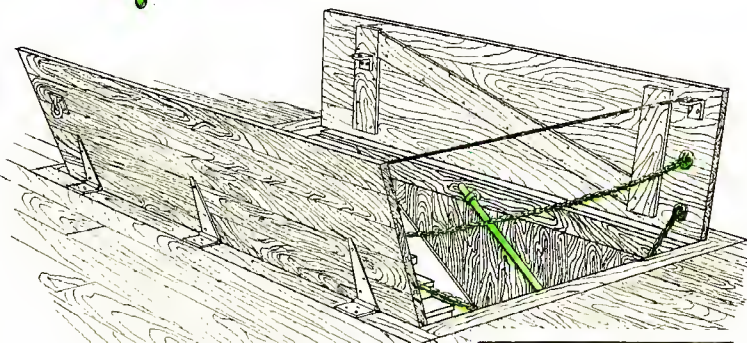
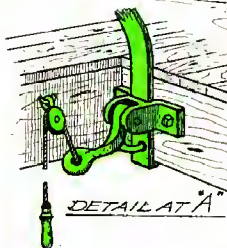
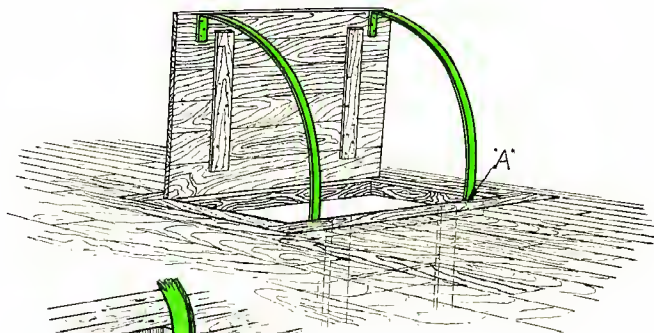
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FLOOR OPENINGS

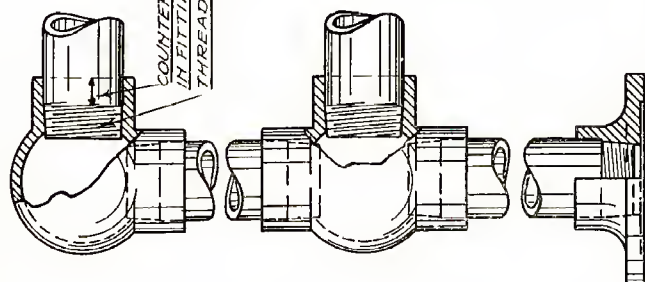


APPROVED STANDARD
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SERVICE BUREAU
 SAFETY ENGINEERING DEPARTMENT
 Drawn By CHT
 Checked By CHT
 Approved By CHT

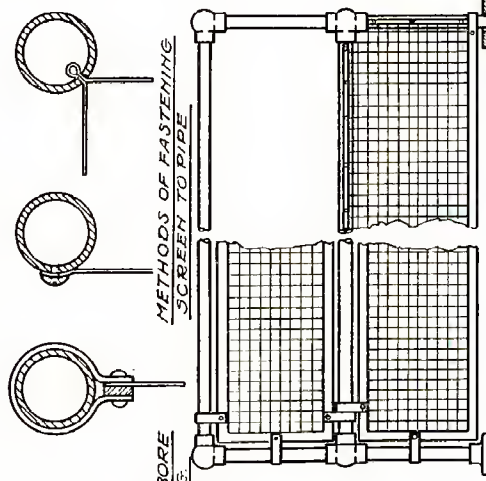
FLOOR OPENINGS



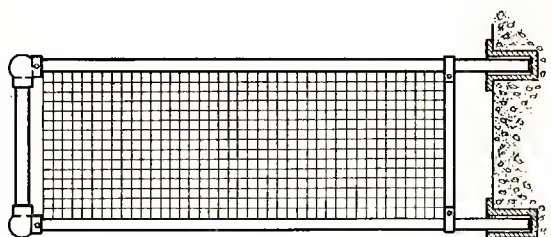
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 WORKMENS COMPENSATION
 SERVICE BUREAU
 SAFETY ENGINEERING DEPARTMENT
 Drawn By W. J. [Signature]
 Checked By [Signature]
 Approved By [Signature]



COUNTERBORED FITTINGS

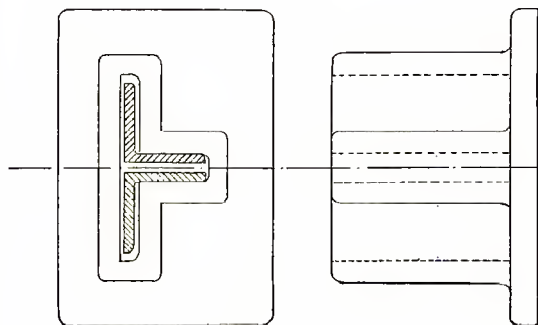


METHODS OF FASTENING
SCREEN TO PIPE

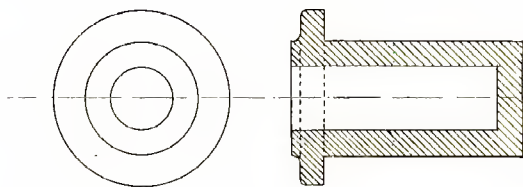


PIPE RAILINGS, GUARDS
AND FITTINGS

APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
DRAFTSMAN W. J. H. H.
CHECKED BY W. J. H. H.
APPROVED BY W. J. H. H.
DATE 1918

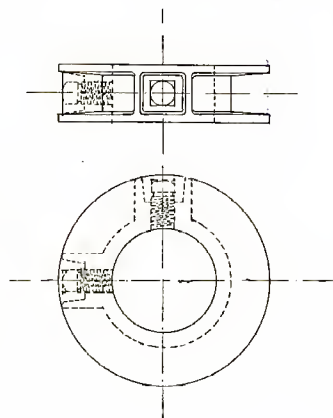


SOCKET FOR POST ANGLE



SOCKET FOR RAILING POST

FLANGE COLLAR



APPROVED STANDARD

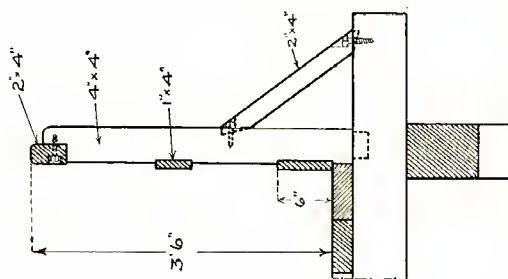
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SERVICE BUREAU

SAFETY ENGINEERING DEPARTMENT

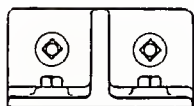
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CHECKED BY W. H. H.

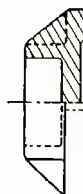
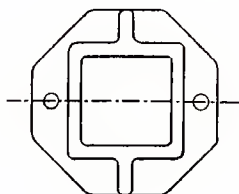
APPROVED BY W. H. H.



APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
DESIGNED BY *E. H. Ferry*
CHECKED BY *E. H. Ferry*
APPROVED BY *E. H. Ferry*
REVISIONS *1*

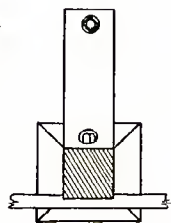
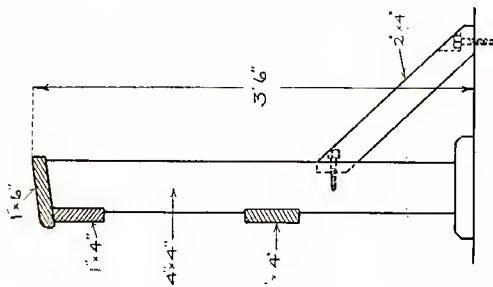


POST BRACKET

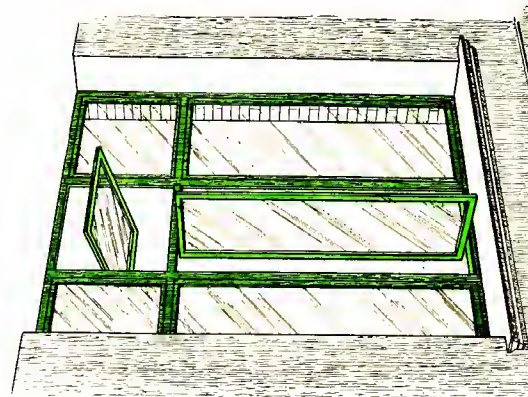


CAST

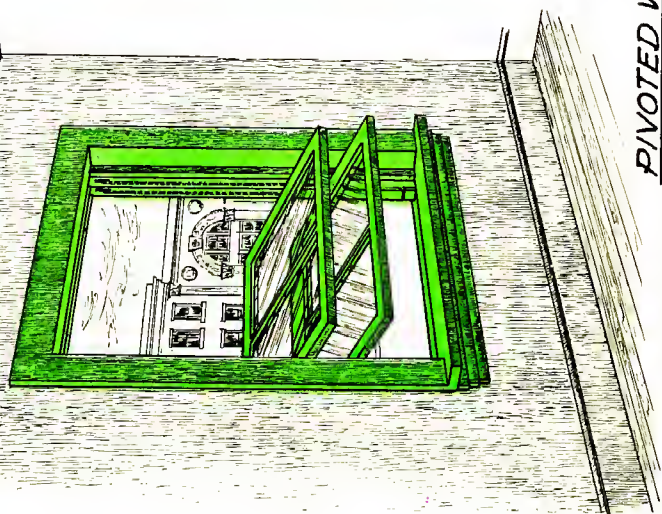
POST SOCKET



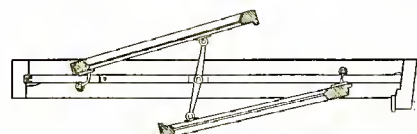
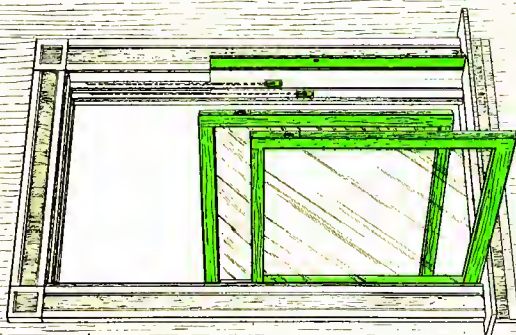
RAILING CONSTRUCTION



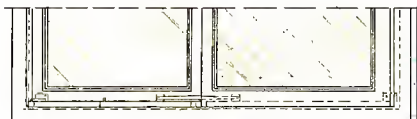
APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
 SAFETY ENGINEERING DEPARTMENT
 CHICAGO, ILL.
 CONSULTED BY _____
 APPROVED BY _____
 DATE _____



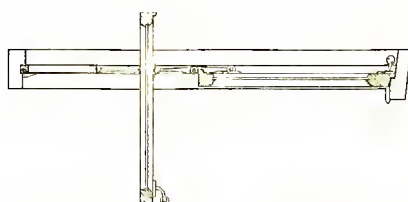
PIVOTED WINDOWS
DESIGNED FOR THE SAFETY OF THE WINDOW CLEANER



OPEN



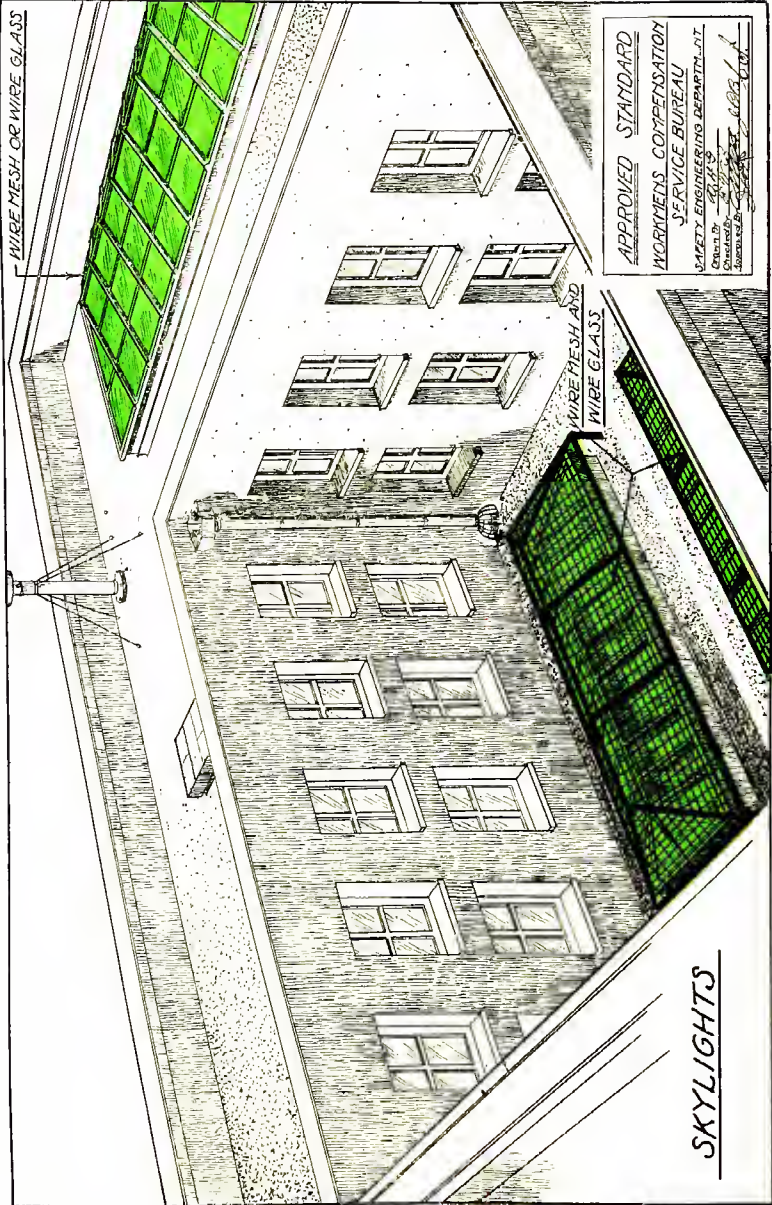
CLOSED



CLEANING POSITION

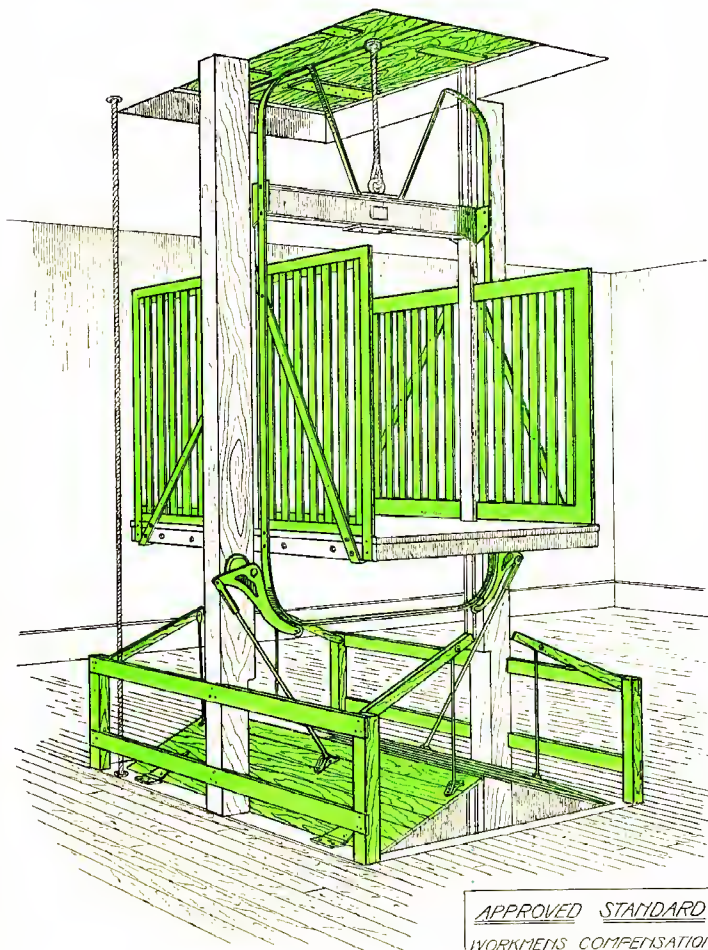
HINGED AND COUNTER
BALANCED WINDOWS
DESIGNED FOR SAFETY IN WINDOW
CLEANING

APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
 Drawn by W. H. H.
 Checked by W. H. H.
 Approved by W. H. H.



APPROVED STANDARD
 WORKMENS COMPENSATION
 SERVICE BUREAU
 SAFETY ENGINEERING DEPARTMENT
 Created by: [Signature]
 Checked by: [Signature]
 Approved by: [Signature]

HATCHWAY WITH AUTOMATIC TRAP DOORS



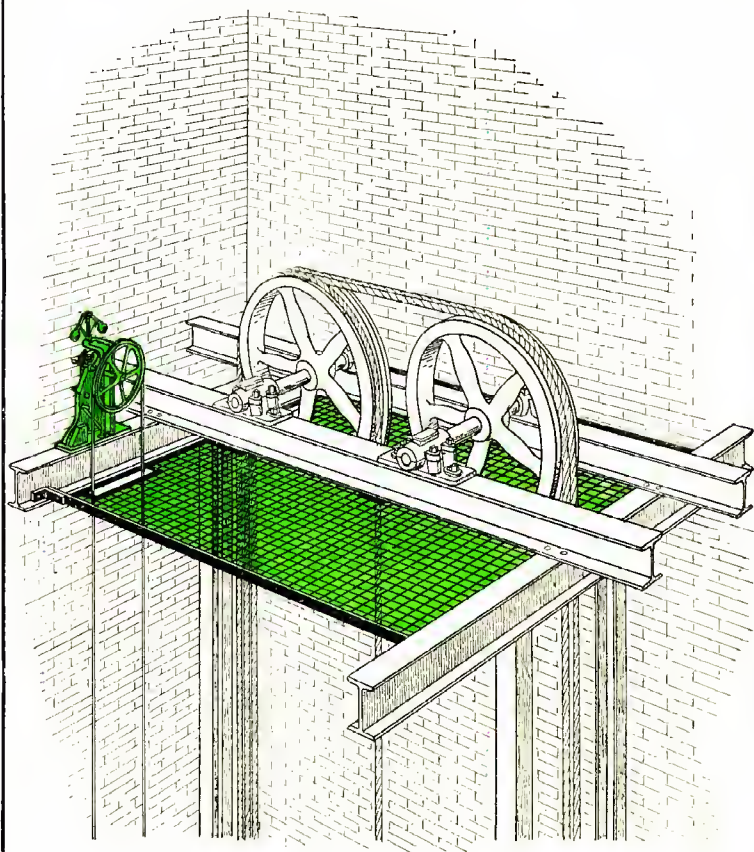
APPROVED STANDARD

WORKMENS COMPENSATION
SERVICE BUREAU

SAFETY ENGINEERING DEPARTMENT

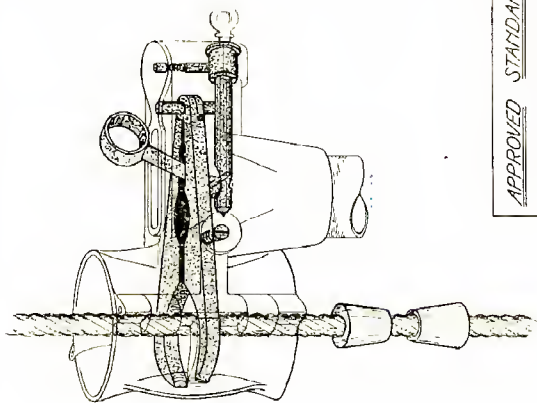
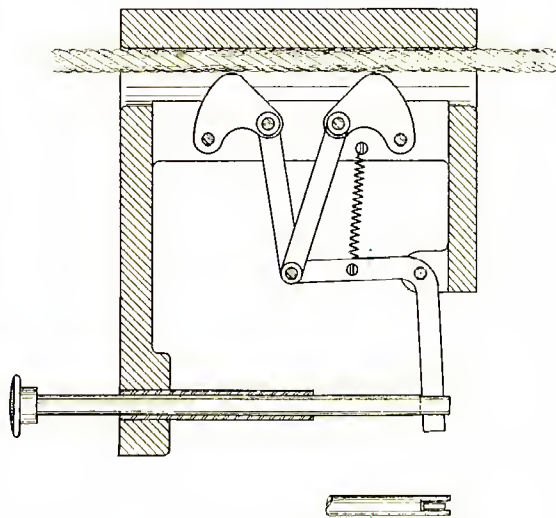
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ELEVATOR SHEAVES AND SPEED GOVERNOR

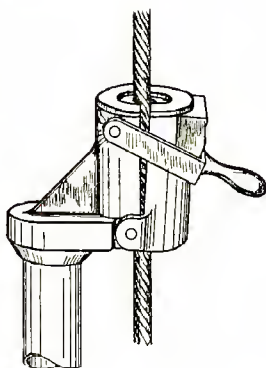
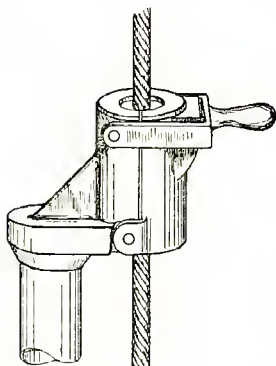
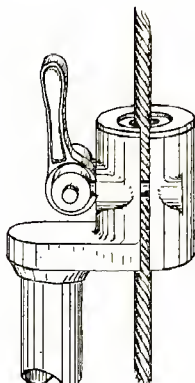
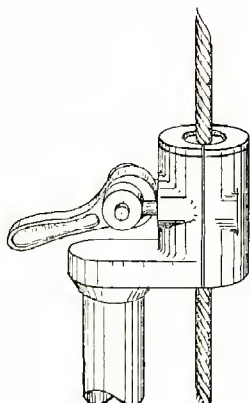


APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
Checked By E.H.P.
Approved By [Signature]

LOCKING DEVICES FOR ELEVATORS CONTROLLED BY HAND ROPES

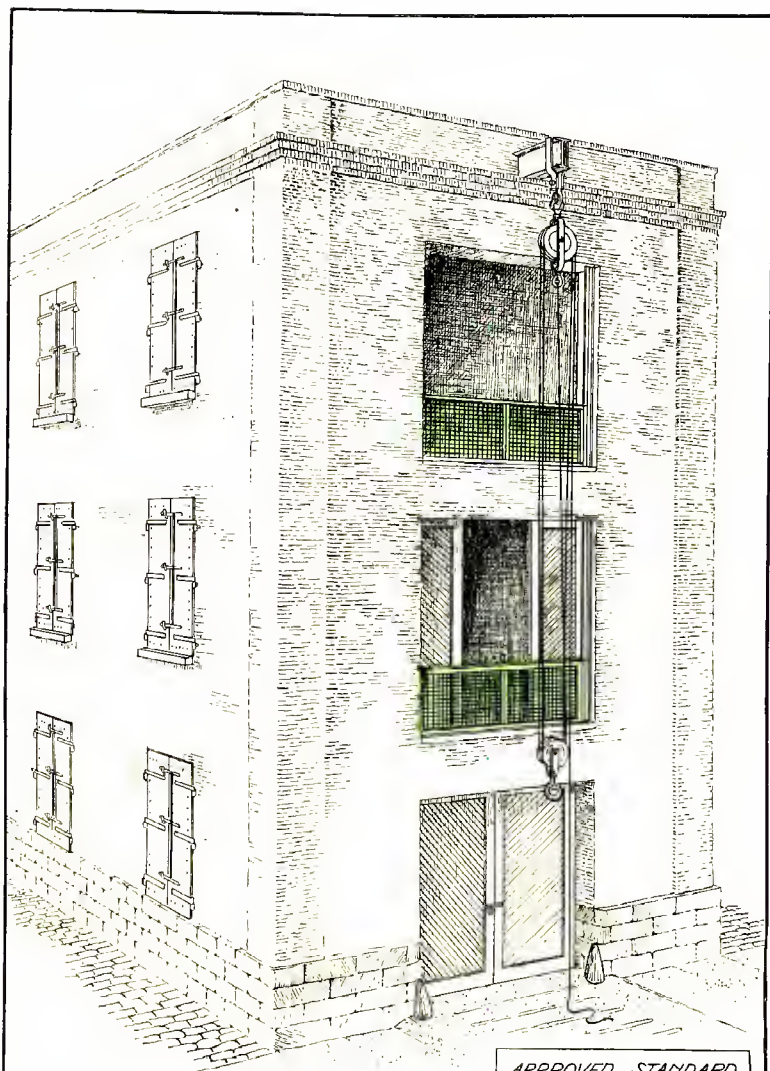


APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
CHICAGO, ILL.
DESIGNED BY
DRAWN BY
CHECKED BY
APPROVED BY



ELEVATOR CABLE LOCKS

APPROVED STANDARD
WORKMEN'S COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
 Drawn By Reynolds
 Checked By W. H. H.
 Approved By W. H. H.



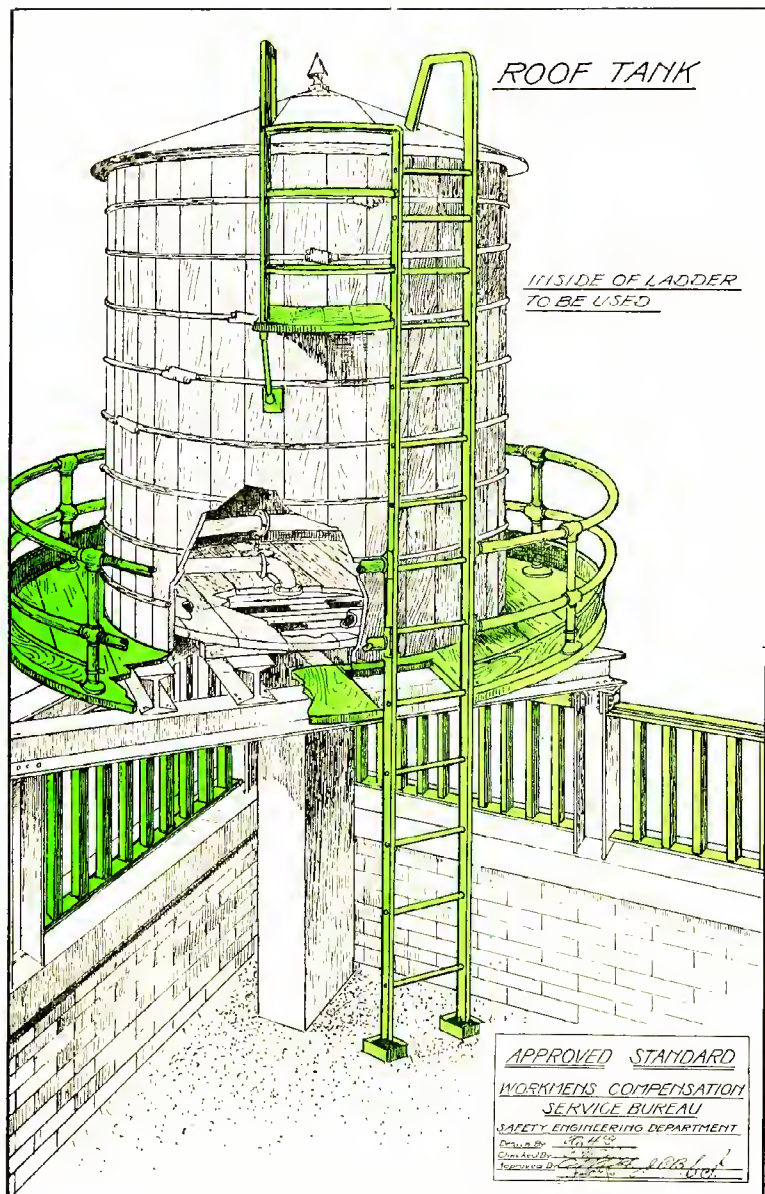
YARD ARM HOIST

APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
 Drawn By: [Signature]
 Checked By: [Signature]
 Approved By: [Signature]

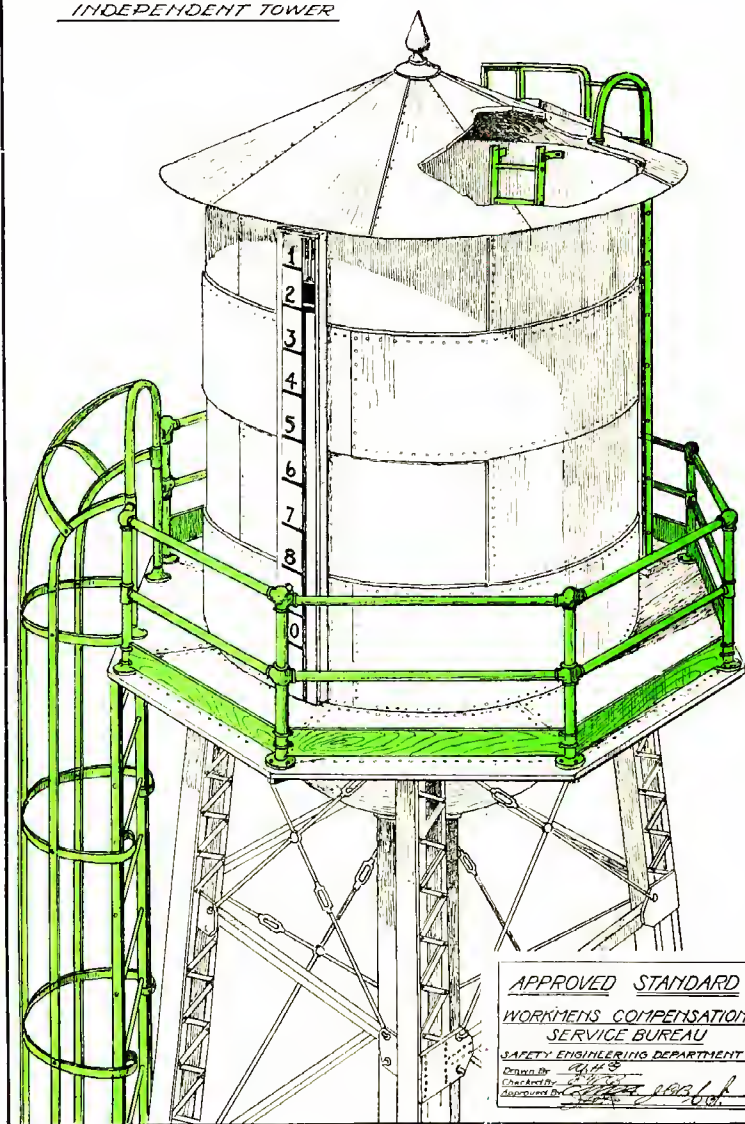
DIAMETER OF CABLE IN INCHES	WEIGHT PER FOOT IN POUNDS OF CABLE WITH HEMP CENTER	MINIMUM DIAMETER OF SHEAVES AND DRUMS IN INCHES	BREAKING STRAIN IN POUNDS	PROPER WORKING LOAD IN POUNDS	FACTOR OF SAFETY
1 $\frac{1}{4}$	2.50	75	54,000	10,800	5
1 $\frac{1}{8}$	2.00	67 $\frac{1}{2}$	40,000	8,000	5
1	1.58	60	32,000	6,000	5
$\frac{7}{8}$	1.20	52 $\frac{1}{2}$	23,000	4,750	5
$\frac{3}{4}$	0.88	45	17,280	3,400	5
$\frac{5}{8}$	0.66	37 $\frac{1}{2}$	10,260	2,100	5
$\frac{9}{16}$	0.44	33 $\frac{3}{4}$	8,540	1,400	6
$\frac{1}{2}$	0.35	30	6,960	1,000	7
$\frac{7}{16}$	0.29	26 $\frac{1}{4}$	6,000	750	8
$\frac{3}{8}$	0.26	22 $\frac{1}{2}$	5,000	500	10

SAFE LOADS
FOR
HOISTING CABLES
19 WIRES TO THE
STRAND (IRON)

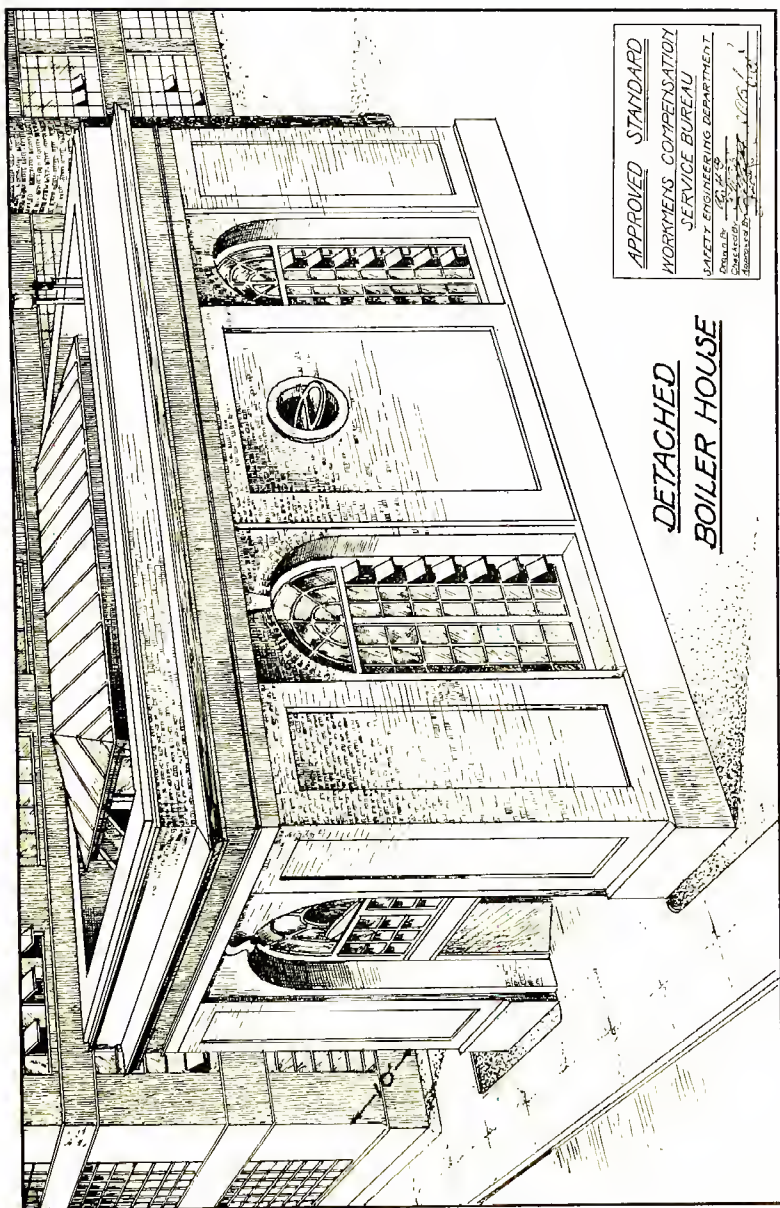
APPROVED STANDARD	
WORKMENS COMPENSATION SERVICE BUREAU	
SAFETY ENGINEERING DEPARTMENT	
Drawn By: <i>P.H.F.</i>	Checked By: <i>[Signature]</i>
Approved By: <i>[Signature]</i>	



ELEVATED TANK
INDEPENDENT TOWER



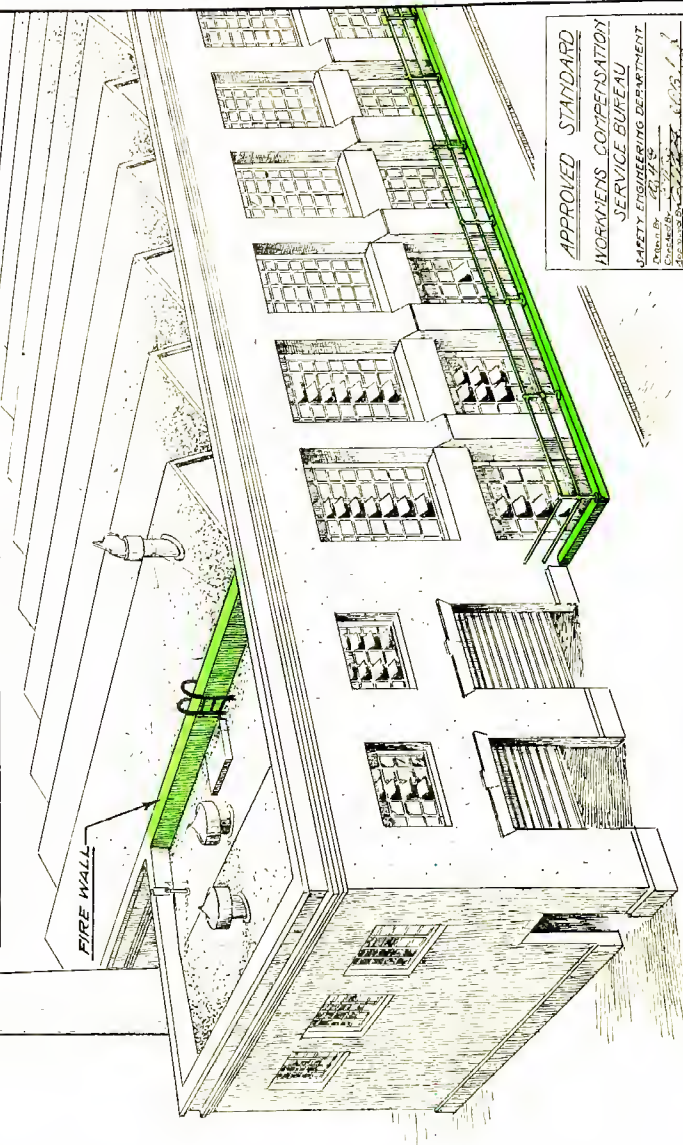
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WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
Checked By [Signature]
Approved By [Signature]



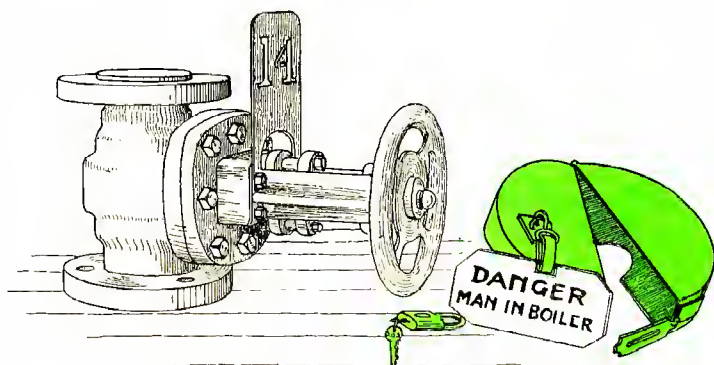
APPROVED STANDARD
 WORKMENS COMPENSATION
 SERVICE BUREAU
 SAFETY ENGINEERING DEPARTMENT
 Drawn by W. H. H.
 Checked by W. H. H.
 Approved by W. H. H.

DETACHED
BOILER HOUSE

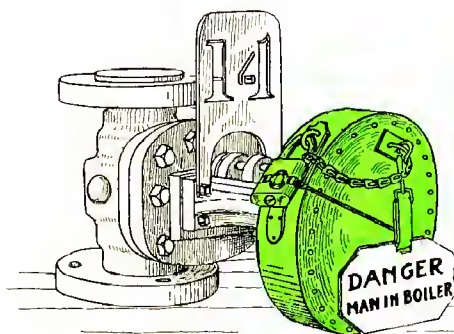
ADJOINING BOILER HOUSE



APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
Drawn By W. H. H.
Checked By W. H. H.
Reviewed By W. H. H.
Date 10/23/18



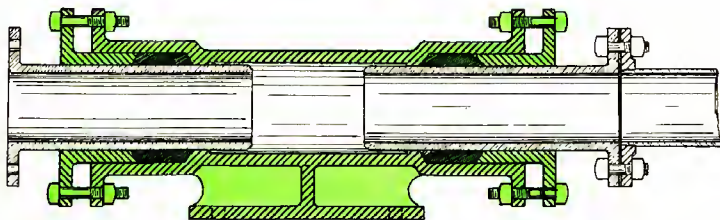
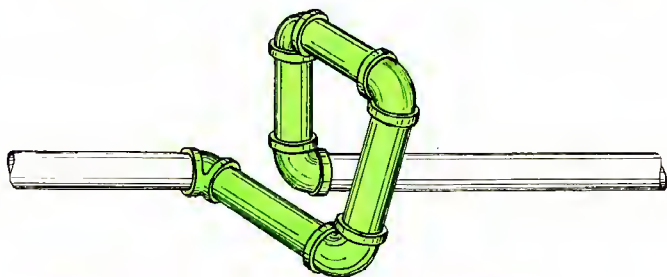
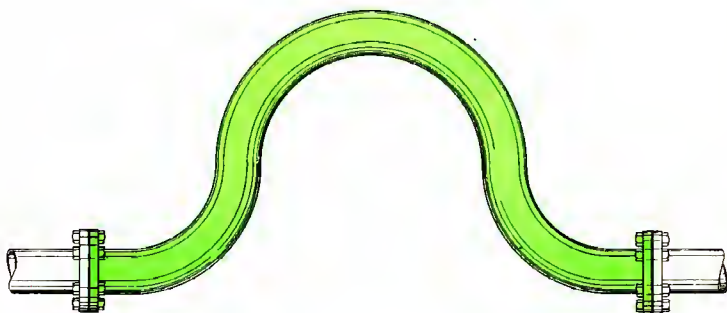
SIGN TO BE RED



VALVE LOCK

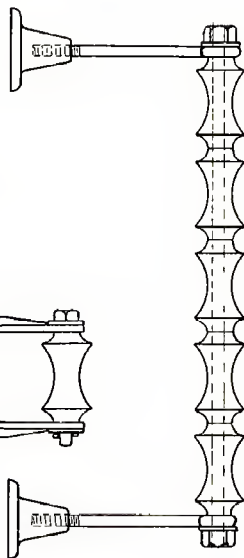
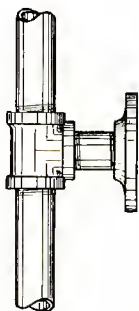
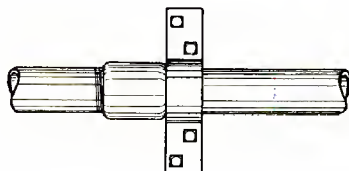
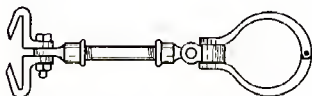
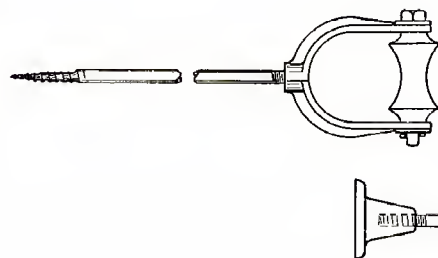
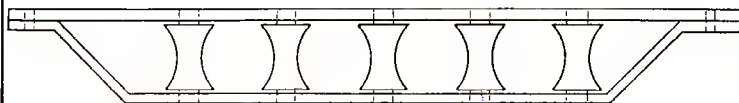
<u>APPROVED STANDARD</u>	
WORKMENS COMPENSATION	
SERVICE BUREAU	
SAFETY ENGINEERING DEPARTMENT	
Checked By	1924
Checked By	
Approved By	

EXPANSION JOINTS



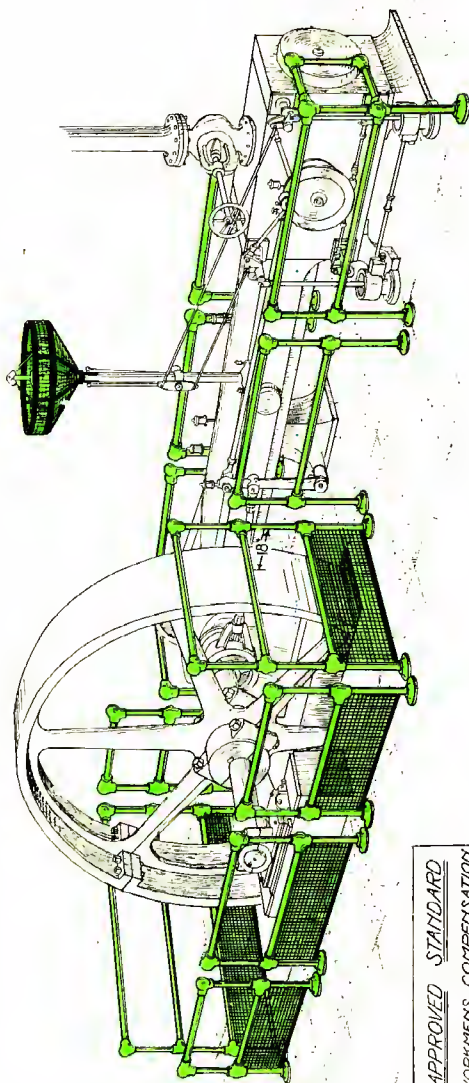
APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
DESIGNED BY _____
CHECKED BY _____
DATE _____

PIPE SUPPORTS AND ANCHORS



APPROVED STANDARD
WORMGERS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
DESIGNED BY: [Signature]
CHECKED BY: [Signature]
APPROVED BY: [Signature]

HORIZONTAL CORLISS ENGINE



APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU

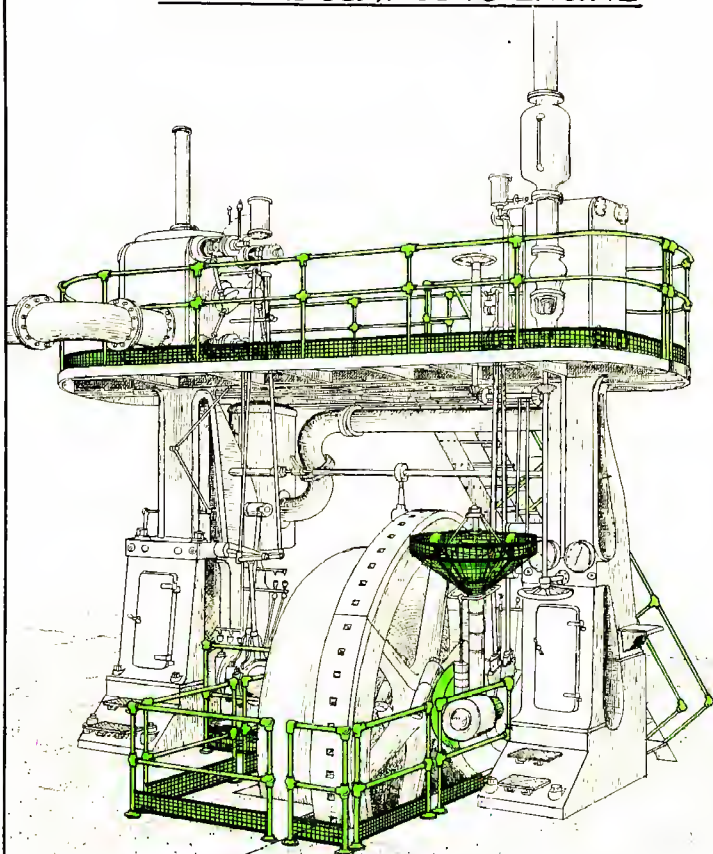
SAFETY ENGINEERING DEPARTMENT

DESIGNED BY W. H. B. B. B.

CHECKED BY W. H. B. B. B.

APPROVED BY W. H. B. B. B.

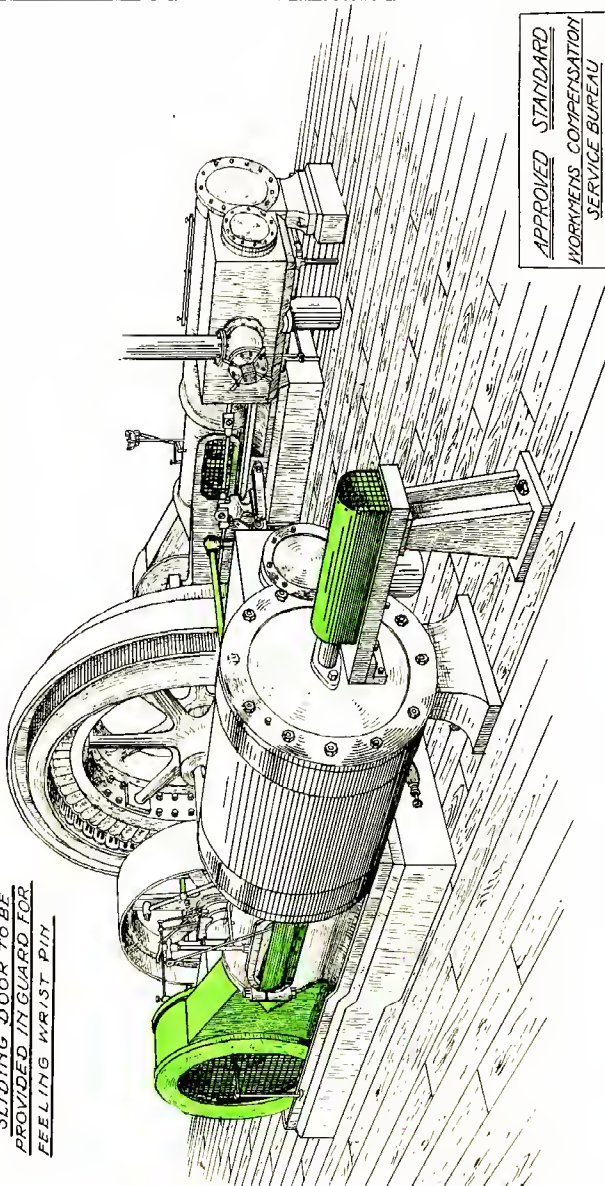
VERTICAL COMPOUND ENGINE



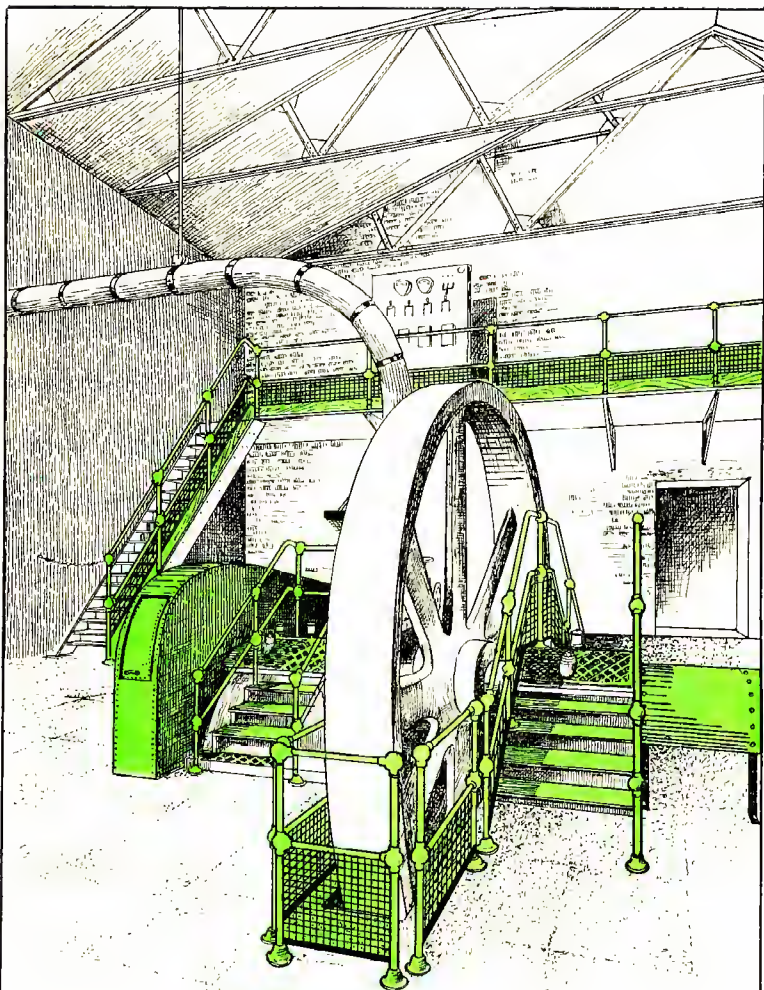
APPROVED STANDARD
 WORKMENS COMPENSATION
 SERVICE BUREAU
 SAFETY ENGINEERING DEPARTMENT
 DRAWN BY _____
 DESIGNED BY _____
 CHECKED BY _____

ENGINE AND GENERATOR

SLIDING DOOR TO BE
PROVIDED IN GUARD FOR
FEELING WRIST PIN



APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
Drawn By W. E. H. H.
Checked By W. E. H. H.
Approved By W. E. H. H.



PASSAGE AND GUARD
OVER JOURNAL

APPROVED STANDARD

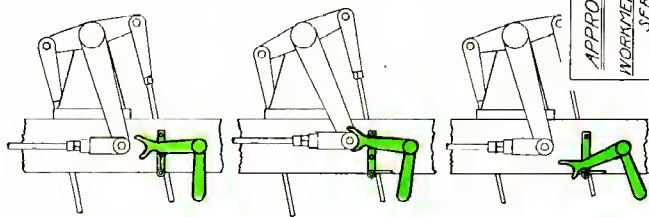
WORKMENS COMPENSATION
SERVICE BUREAU

SAFETY ENGINEERING DEPARTMENT

Drawn By W.H.C.

Checked By W.H.C.

Approved By W.H.C.

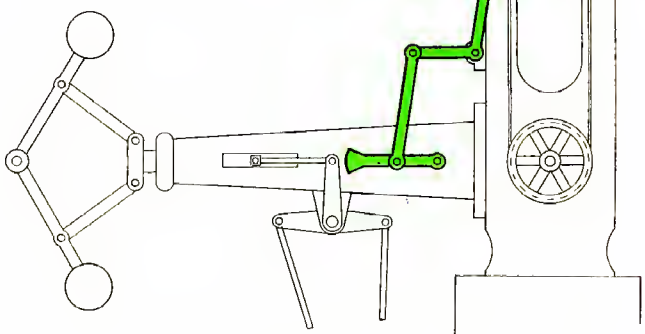
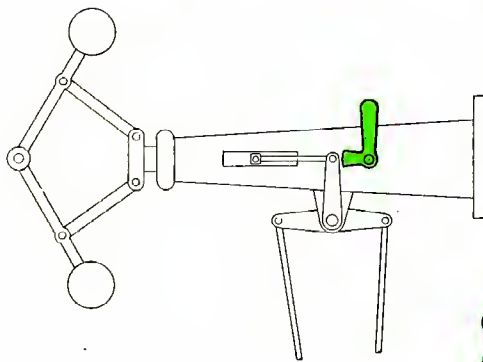


APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU

SAFETY ENGINEERING DEPARTMENT

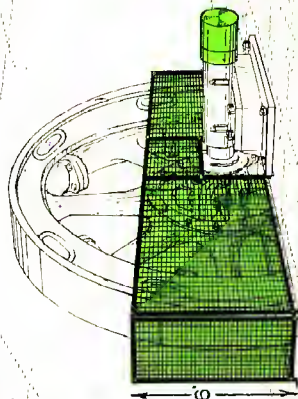
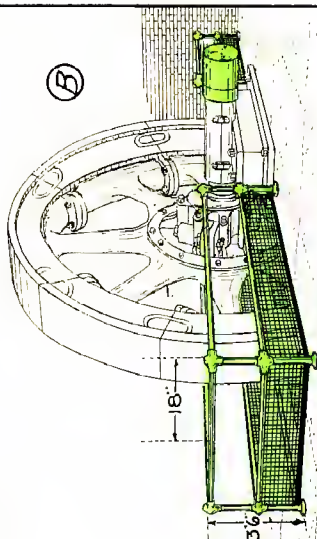
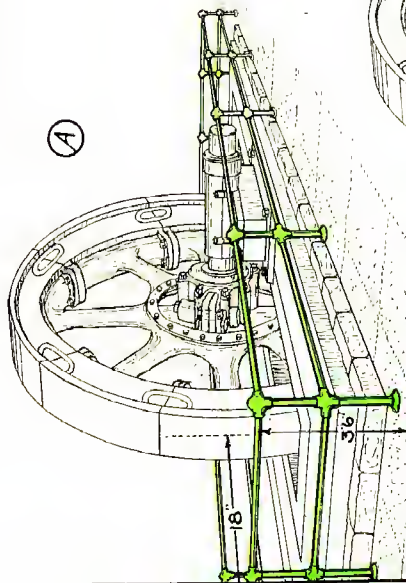
CHAS. E. BROWN
CHAS. E. BROWN
CHAS. E. BROWN

CHAS. E. BROWN
CHAS. E. BROWN
CHAS. E. BROWN



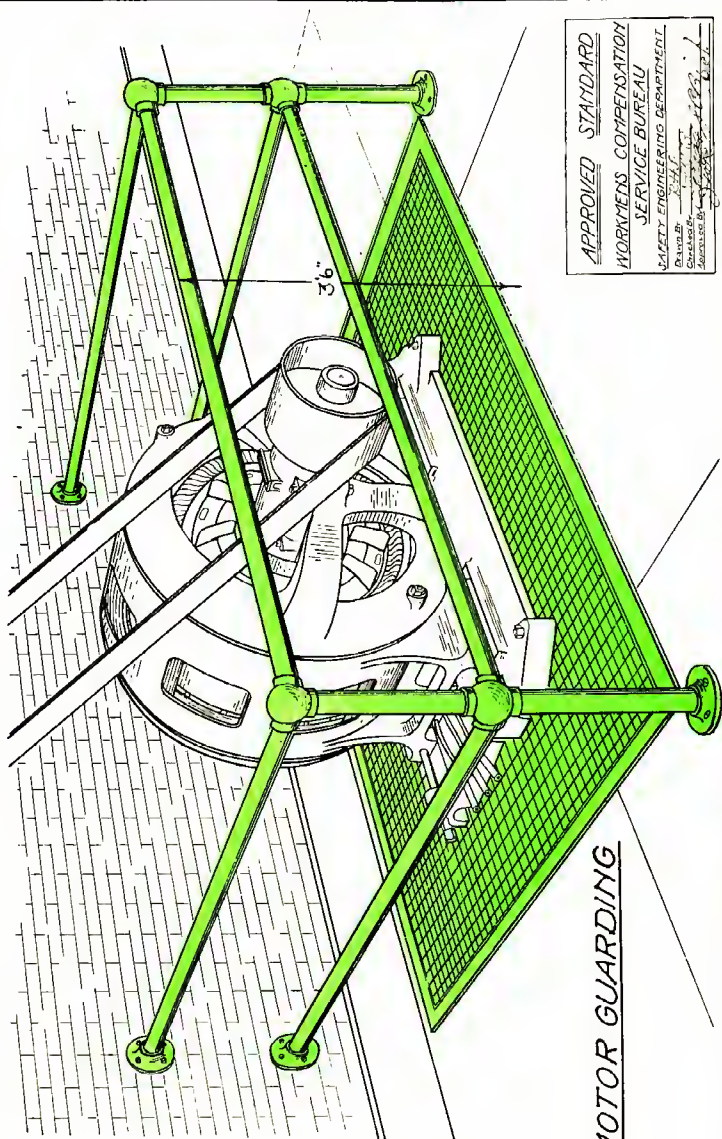
SAFETY ATTACHMENTS
FOR
ENGINE VALVE GEARS

PIT GUARDING



APPROVED STANDARD
LYONNENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT

Drawn By: [Signature]
Checked By: [Signature]
Approved By: [Signature]

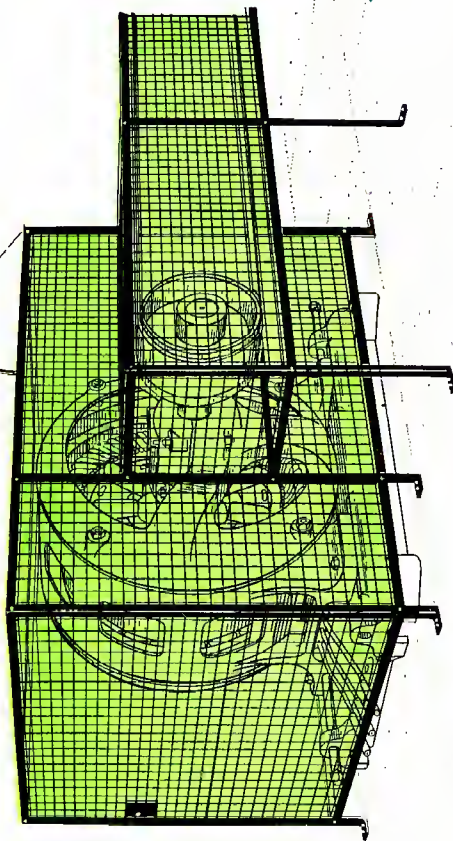


MOTOR GUARDING

APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU

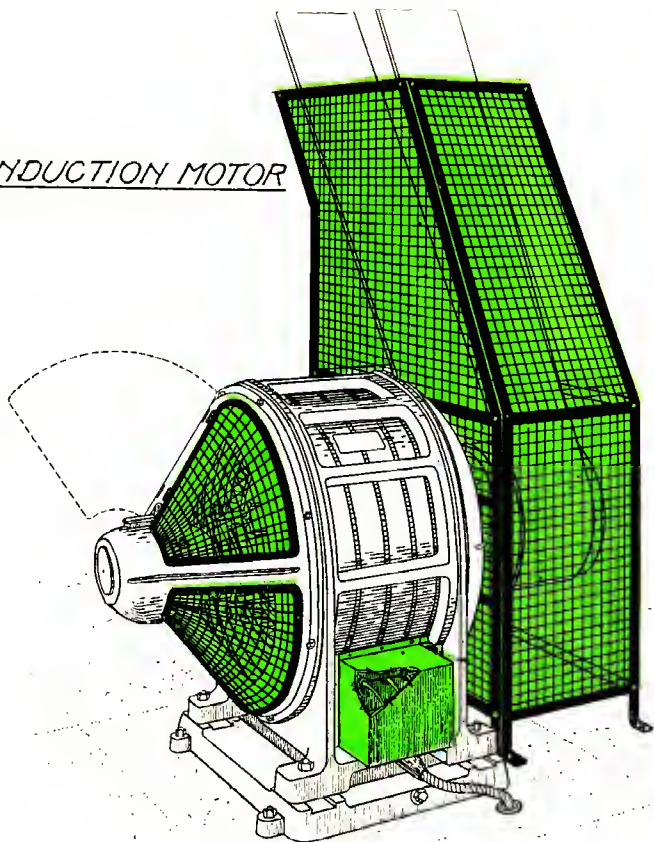
SAFETY ENGINEERING DEPARTMENT
 DRAWN BY: W. H. H. H.
 CHECKED BY: W. H. H. H.
 APPROVED BY: W. H. H. H.

MOTOR GUARDING



APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
Drawn By W. H. H. H.
Checked By W. H. H. H.
Date 10-1-1934

INDUCTION MOTOR

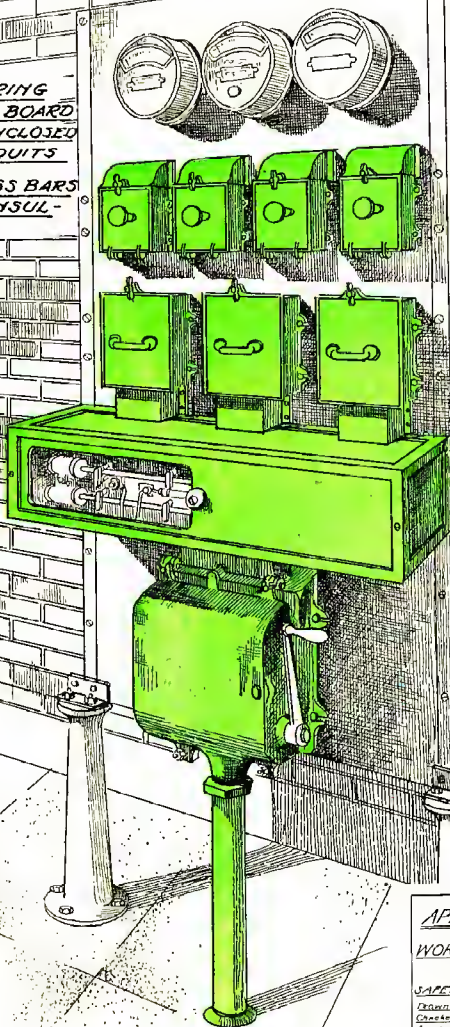


APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
DESIGNED BY W. L. H. H.
CHECKED BY W. L. H. H.
APPROVED BY W. L. H. H.

SWITCH BOARD

ALL WIRING
BEHIND BOARD
TO BE ENCLOSED
IN CONDUITS

ALL BUSS BARS
TO BE INSUL-
ATED



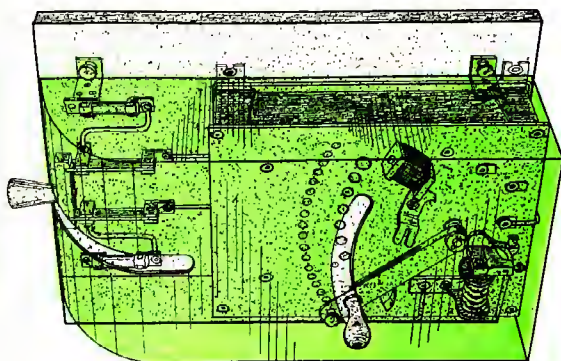
APPROVED STANDARD

WORKMEN'S COMPENSATION
SERVICE BUREAU

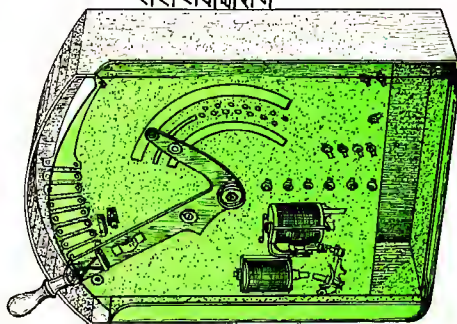
SAFETY ENGINEERING DEPARTMENT

Drawn By W. H. G.
Checked By W. H. G.
Approved By W. H. G.

COMPOUND STARTING PANEL



NON-REVERSIBLE CONTROLLER



FOR LINE SHAFT
MOTOR PROVIDE
NO-VOLTAGE, OVER
LOAD, PUSH
BUTTON RELEASE
AND DYNAMIC
BRAKE.

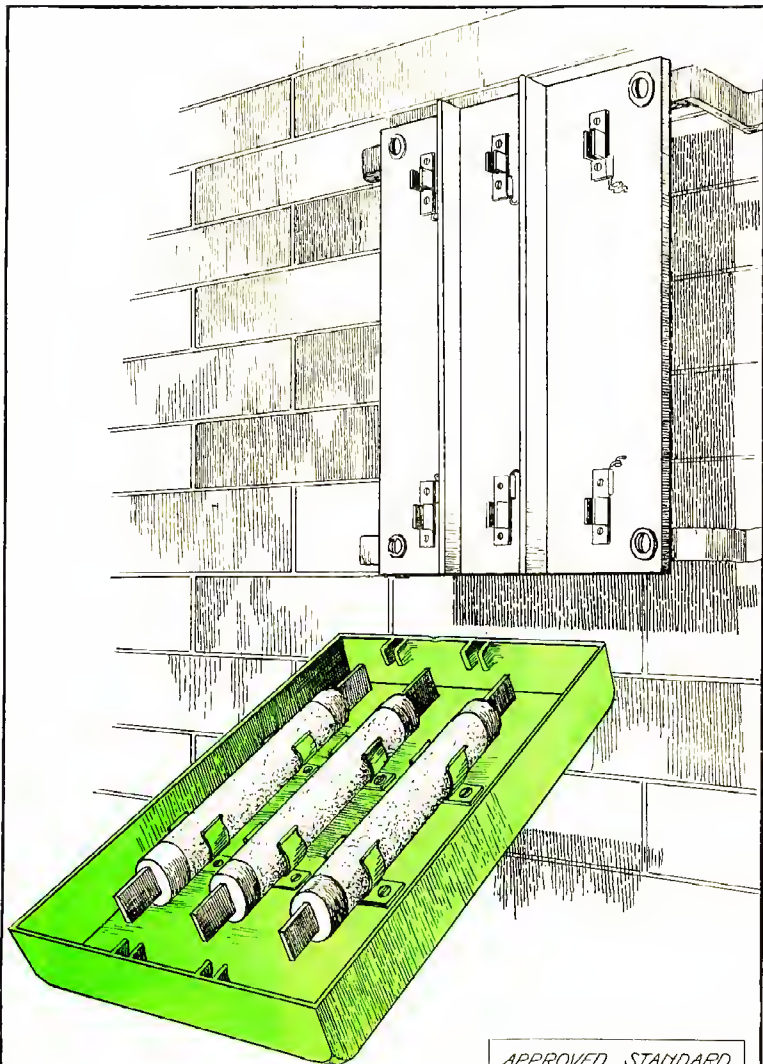
APPROVED STANDARD

WOMMENS COMPENSATION
SERVICE BUREAU

SAFETY ENGINEERING DEPARTMENT

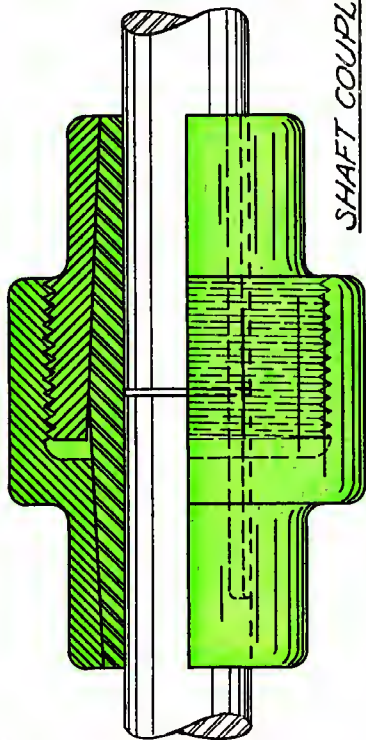
CHAS. E. JONES
CHAS. E. JONES
CHAS. E. JONES

CHAS. E. JONES
CHAS. E. JONES
CHAS. E. JONES

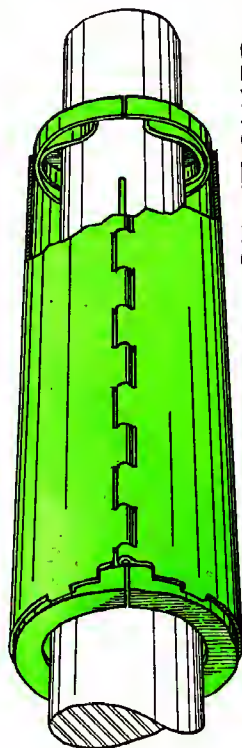
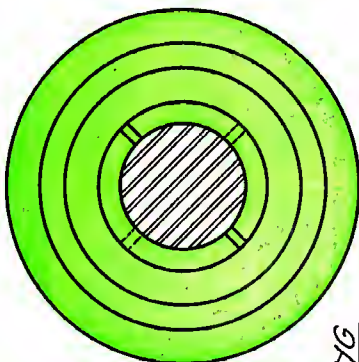


SAFETY FUSE BOX

APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
 DRAWN BY CH 11
 CHECKED BY CH 11
 APPROVED BY CH 11



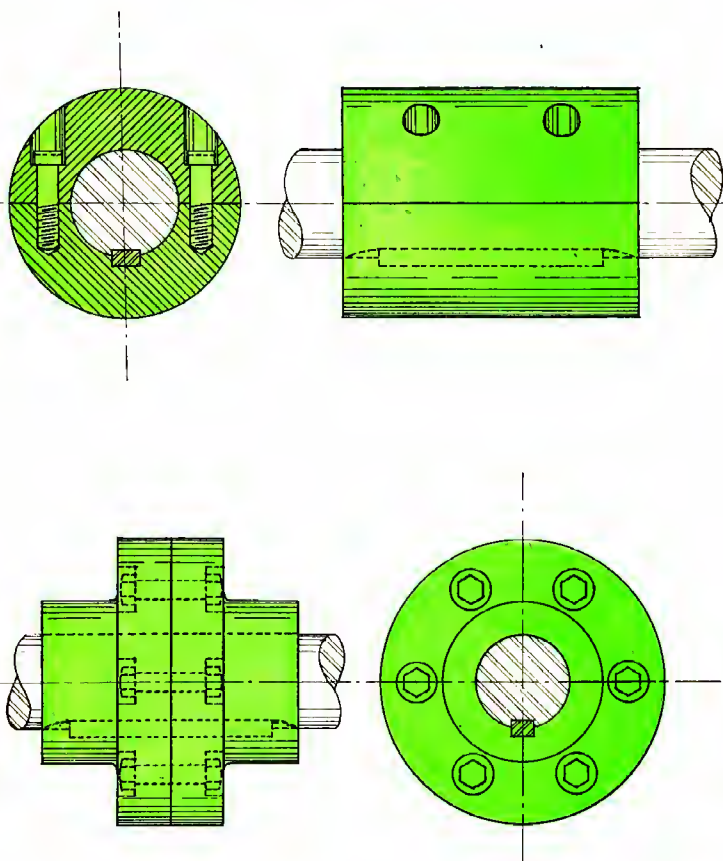
SHAFT COUPLING
PATENTED



SHAFT GUARD PATENTED

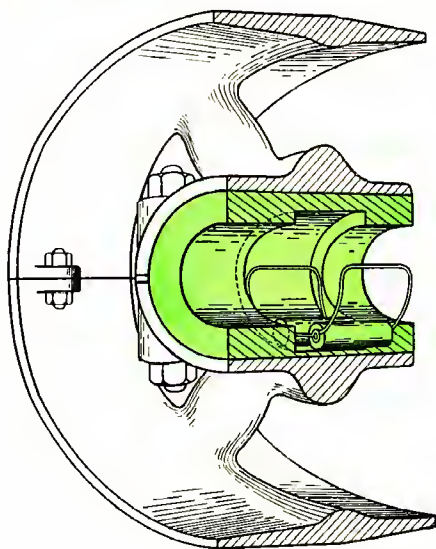
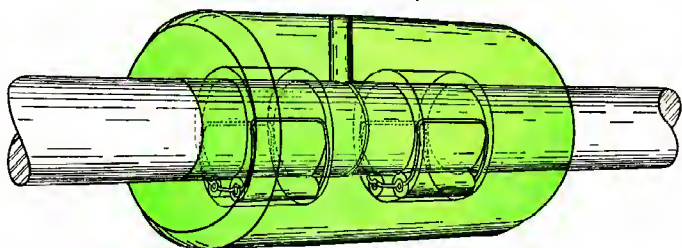
APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
Created By: W. H. H. H.
Reviewed By: W. H. H. H.
Approved By: W. H. H. H.

SAFETY COUPLINGS



APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
 SAFETY ENGINEERING DEPARTMENT
 Design By W. H. D.
 Checked By W. H. D.
 Approved By W. H. D.

SAFETY COUPLING AND HUB BUSHING



APPROVED STANDARD

WORKMENS COMPENSATION
SERVICE BUREAU

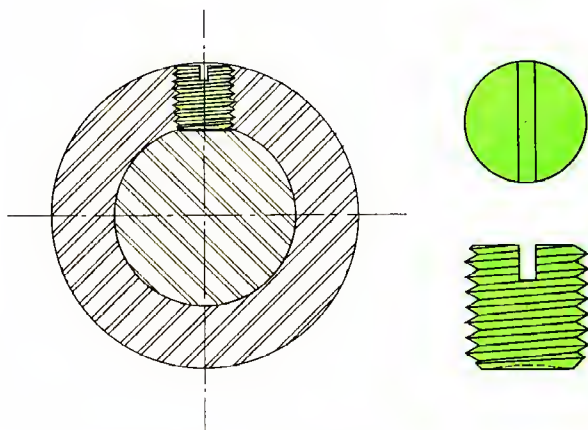
SAFETY ENGINEERING DEPARTMENT

Drawn By W.H.F.

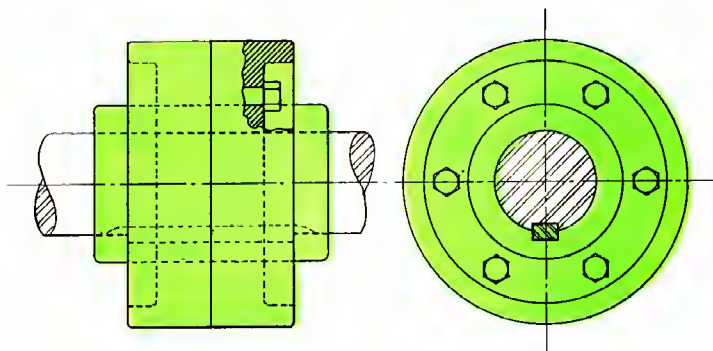
Checked By W.H.F.

Approved By W.H.F.

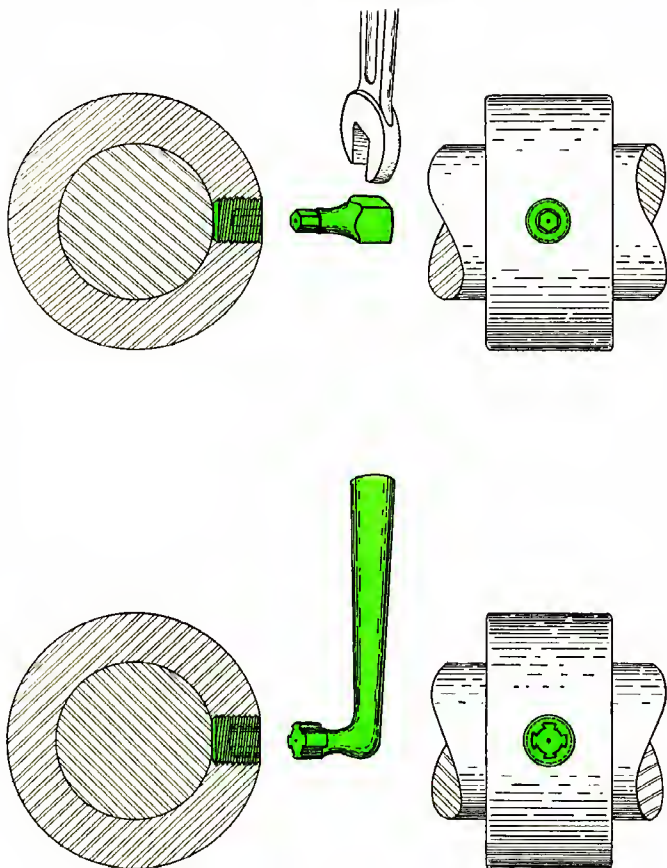
SAFETY SET SCREW



SAFETY COUPLING



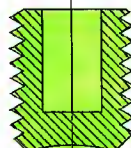
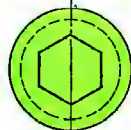
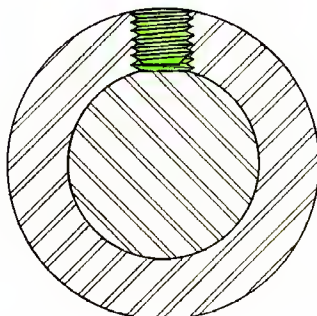
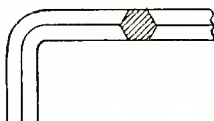
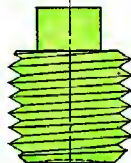
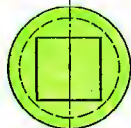
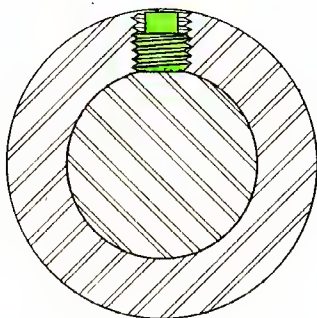
APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
 Drawn By: COCH
 Checked By: COCH
 Approved By: COCH



SAFETY SET SCREWS

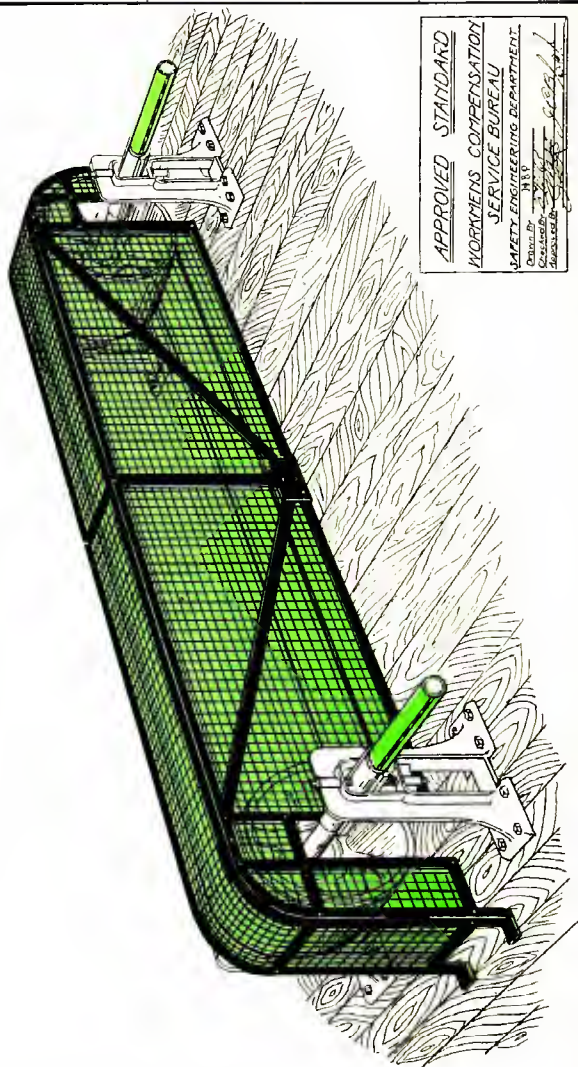
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<u>WORKMENS COMPENSATION</u>	
<u>SERVICE BUREAU</u>	
<u>SAFETY ENGINEERING DEPARTMENT</u>	
Drawn By	<u>E. J. G. H.</u>
Checked By	<u>E. J. G. H.</u>
Approved By	<u>E. J. G. H.</u>

SAFETY SET SCREWS

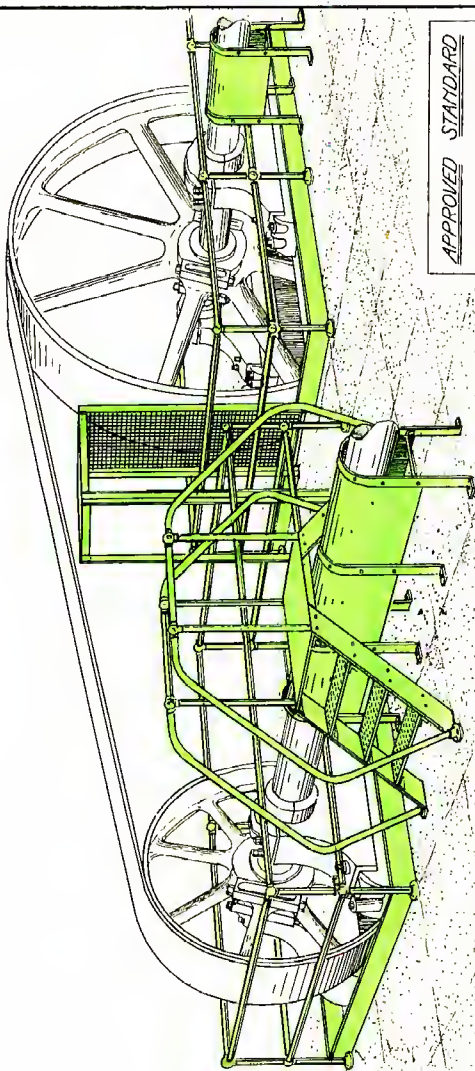


APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
 DESIGNED BY W. H. H. H.
 CHECKED BY W. H. H. H.
 APPROVED BY W. H. H. H.

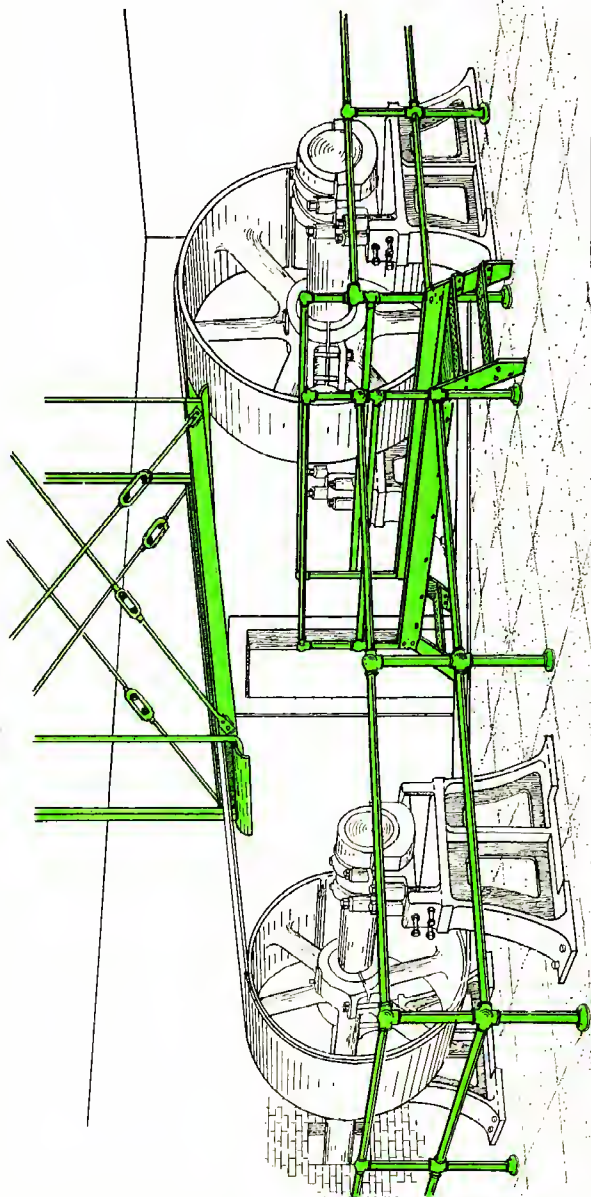
BELT AND SHAFT GUARDING



BELT, PIT AND SHAFT GUARDING

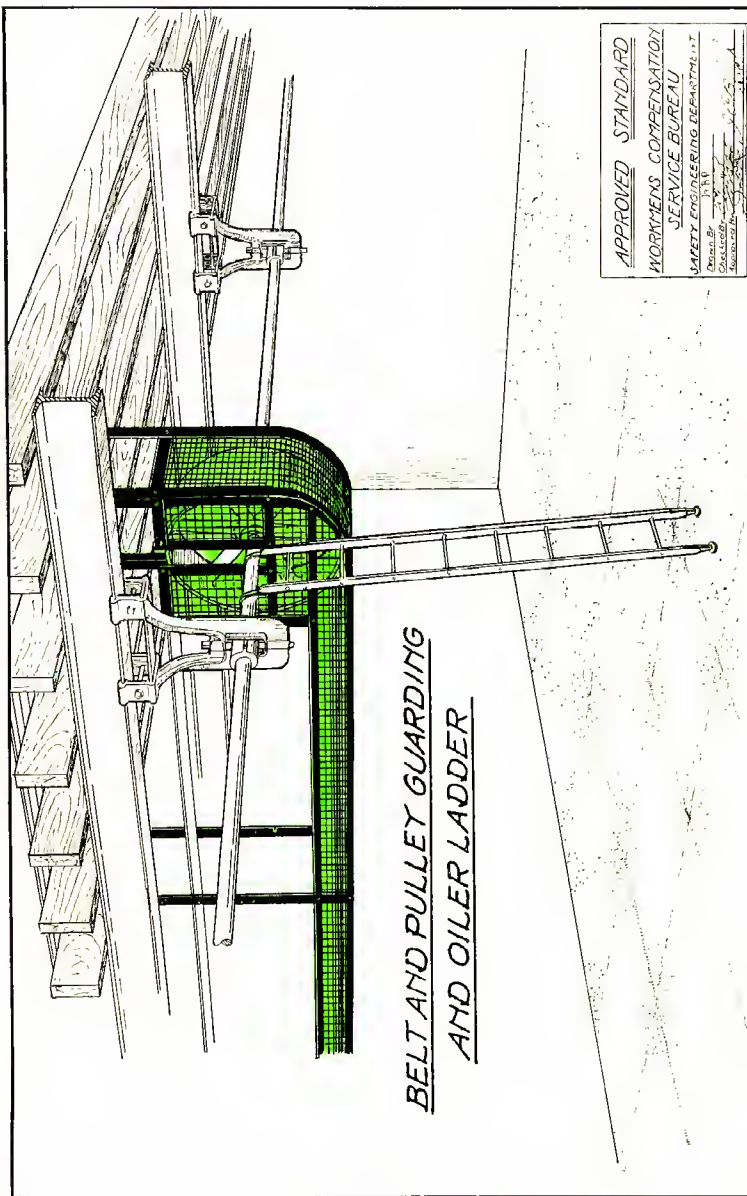


APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
 DIVISION OF
 MINES
 DEPARTMENT OF
 COMMERCE
 WASHINGTON, D. C.



APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
 Drawn By H. B. V.
 Checked By E. J. V.
 Approved By E. J. V.

BELT AND PULLEY GUARDS

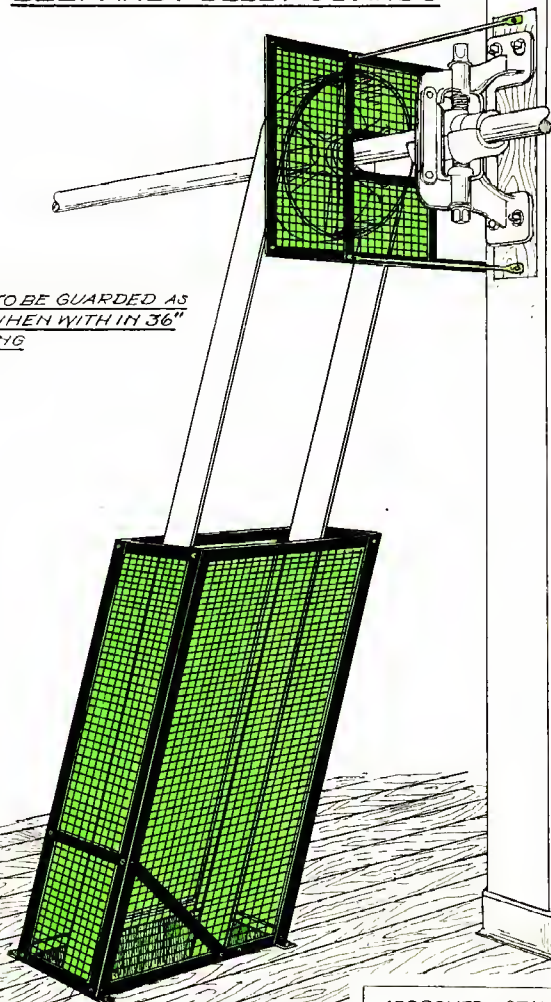


BELT AND PULLEY GUARDING
AND OILER LADDER

APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
Desig. By H. E. V.
Checked By J. E. V.
Approved By J. E. V.

BELT AND PULLEY GUARDS

PULLEY TO BE GUARDED AS
SHOWN WHEN WITH IN 36"
OF BEARING



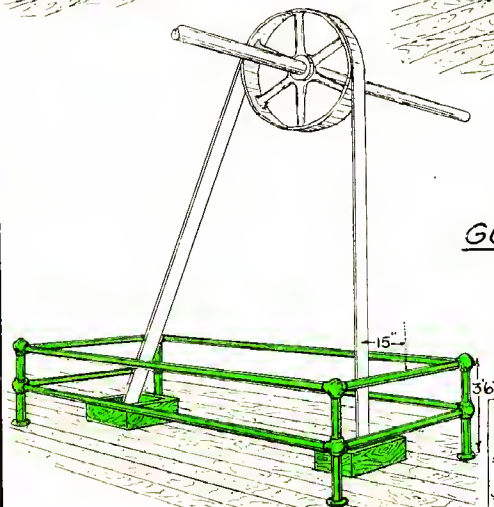
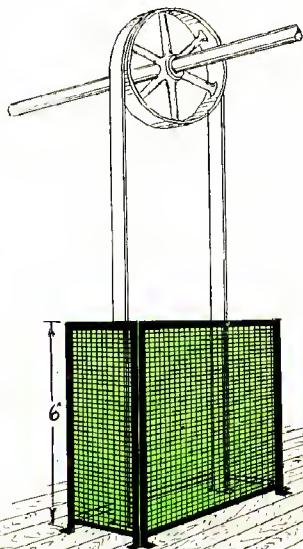
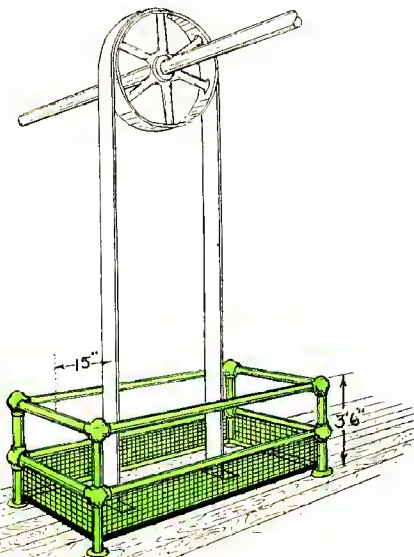
APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU

SAFETY ENGINEERING DEPARTMENT

Drawn By 1880

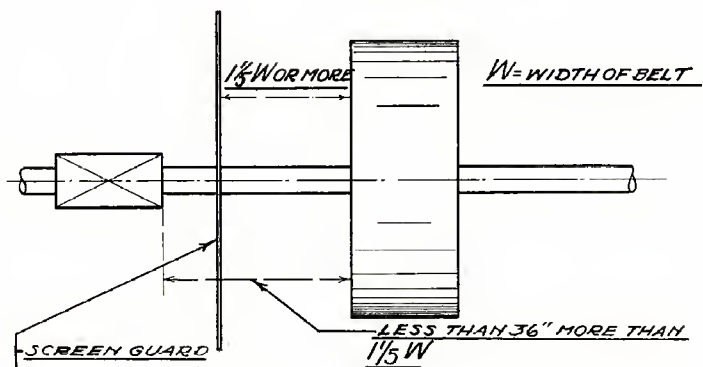
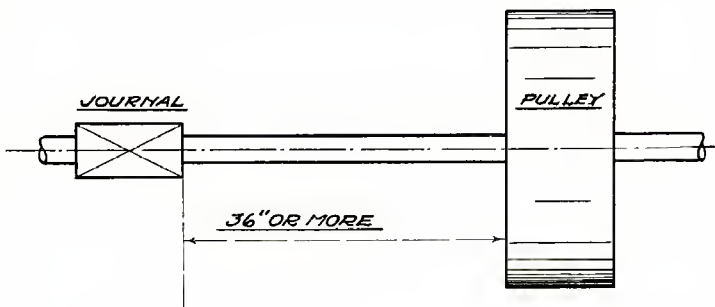
Checked By

Approved By



BELT GUARDING

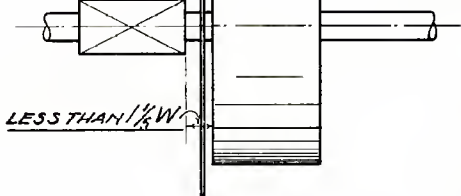
APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
Drawn By W. B. D.
Checked By W. B. D.
Approved By W. B. D.



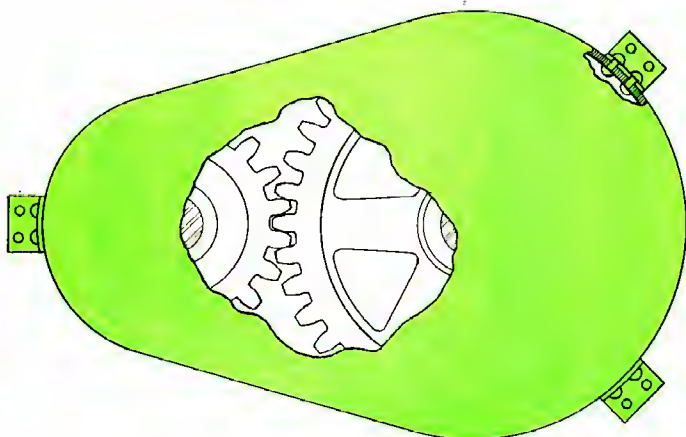
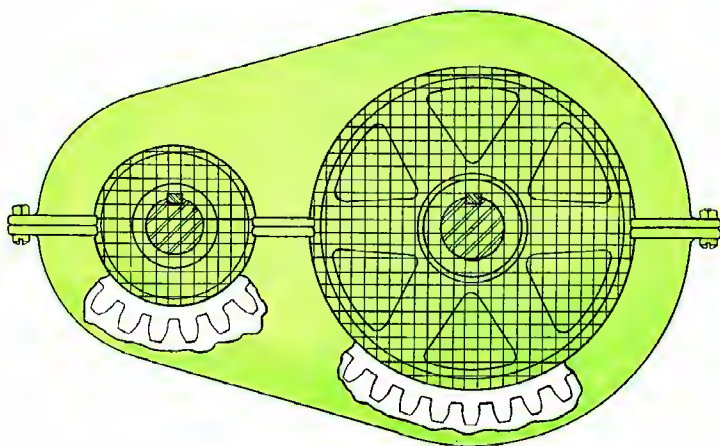
SCREEN GUARD

$\frac{1}{5} W$

PULLEY GUARDS
FOR
OVERHEAD SHAFTING



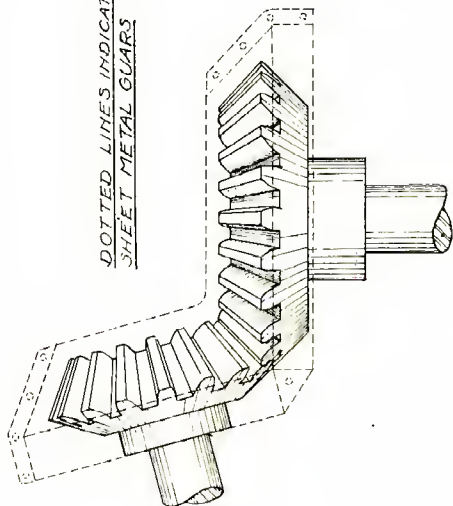
APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
Drawn By W. H. H. H.
Checked By W. H. H. H.
Approved By W. H. H. H.



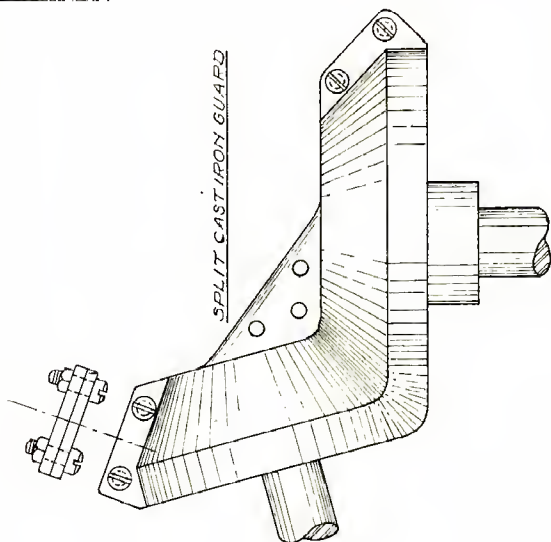
SPUR GEAR GUARD

<u>APPROVED</u>	<u>STANDARD</u>
<u>WORKMENS COMPENSATION</u>	
<u>SERVICE BUREAU</u>	
<u>SAFETY ENGINEERING DEPARTMENT</u>	
Checked by	_____
Inspected by	_____
Approved by	_____

DOTTED LINES INDICATE
SHEET METAL GUARDS



SPLIT CAST IRON GUARD

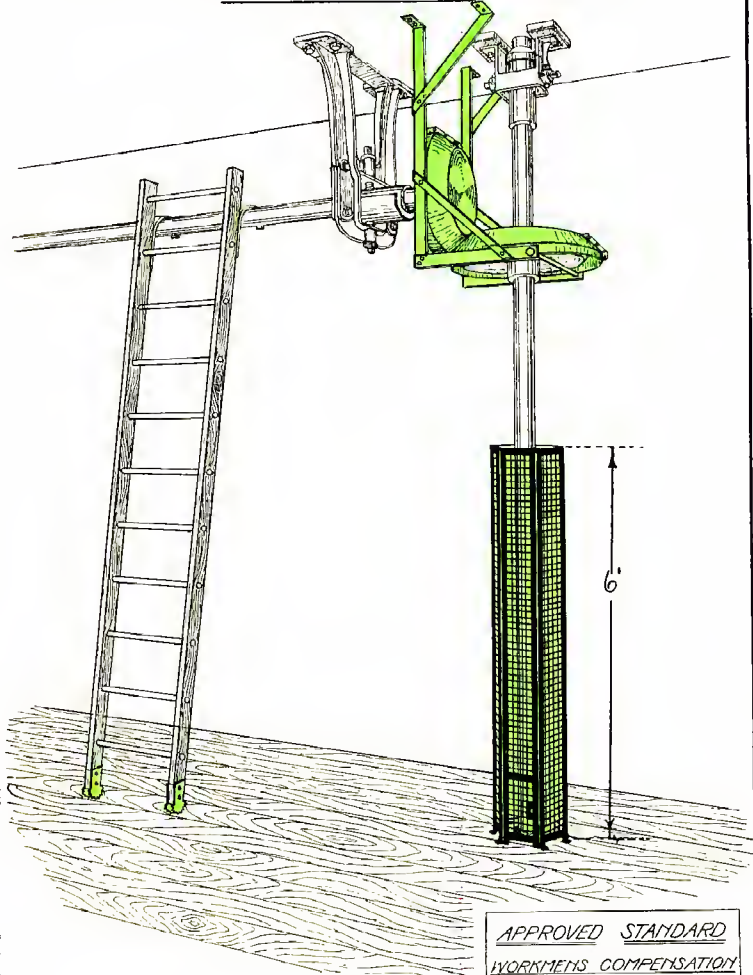


BEVEL GEAR GUARDS

APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT

DESIGNED BY: W. H. W.
CHECKED BY: W. H. W.
DATE: 10/20/18

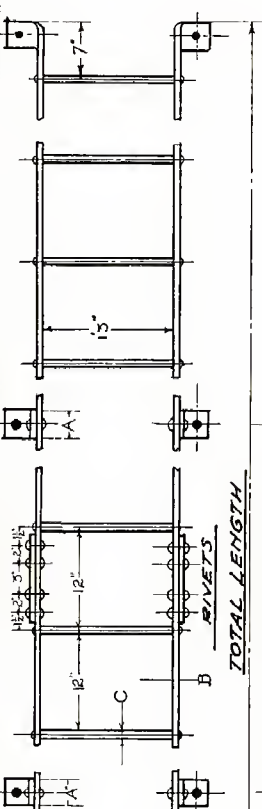
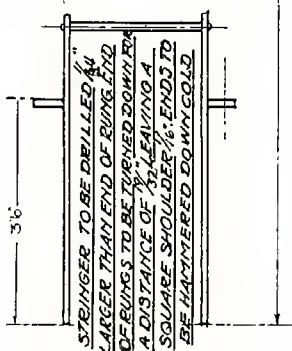
VERTICAL SHAFTING BEVEL GEARS AND OILERS LADDER



APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
 DESIGNED BY W.C.H.
 CHECKED BY W.C.H.
 APPROVED BY W.C.H.

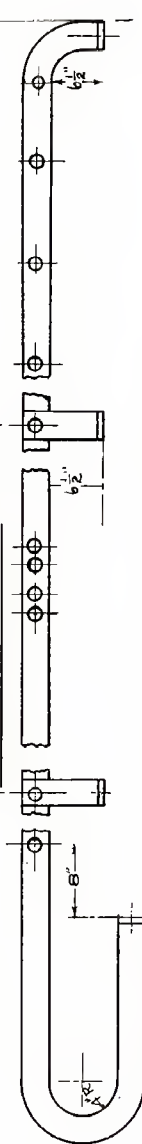
LADDERS

BENT PL. SPICE PLATES TO BE FROM SAME STOCK AS STRINGER



TOTAL LENGTH

DISTANCE BETWEEN SUPPORTS
TO BE 12 FEET OR LESS



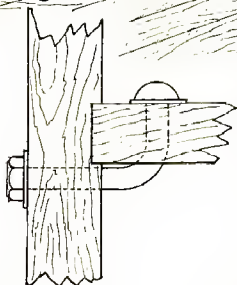
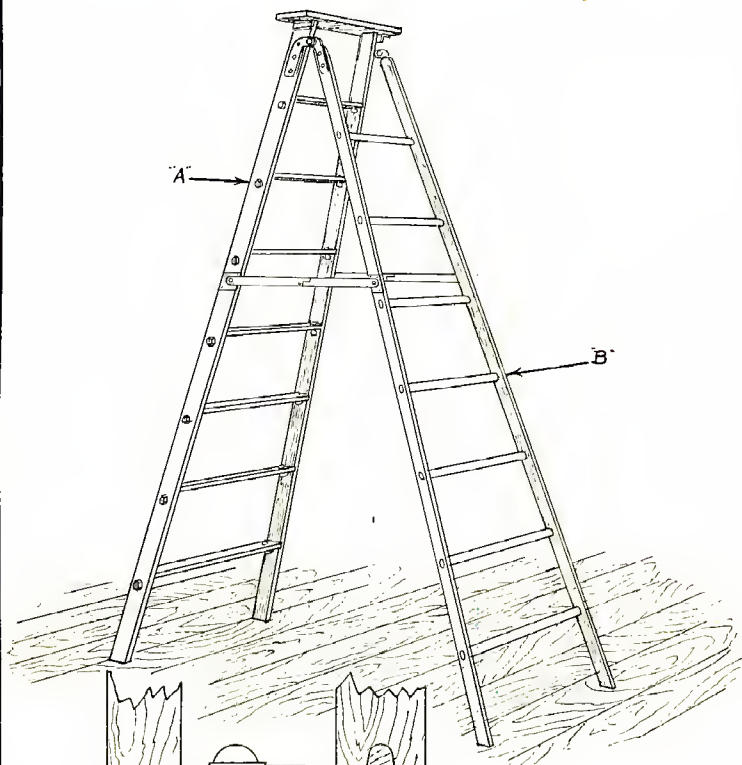
FOR INTERIOR LADDERS TOTAL
LENGTH 12 FEET OR LESS

FOR ALL OTHER LADDERS

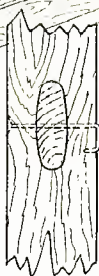
A	B	C
2"	1" $\frac{1}{2}$	5" $\frac{5}{8}$
3"	1" $\frac{1}{2}$	3"-1"

APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
DRAWN BY: W. H. S.
CHECKED BY: W. H. S.
APPROVED BY: W. H. S.
DATE: 1931

APPROVED TYPE OF STEP LADDER



DETAIL OF "A"

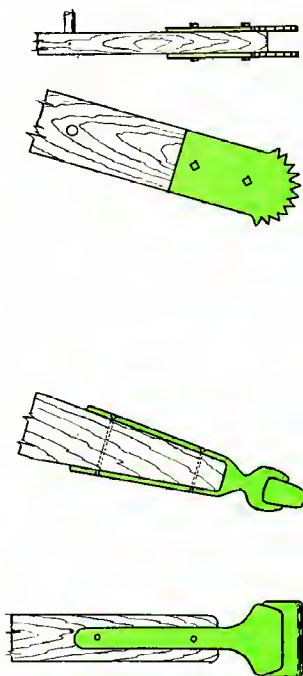
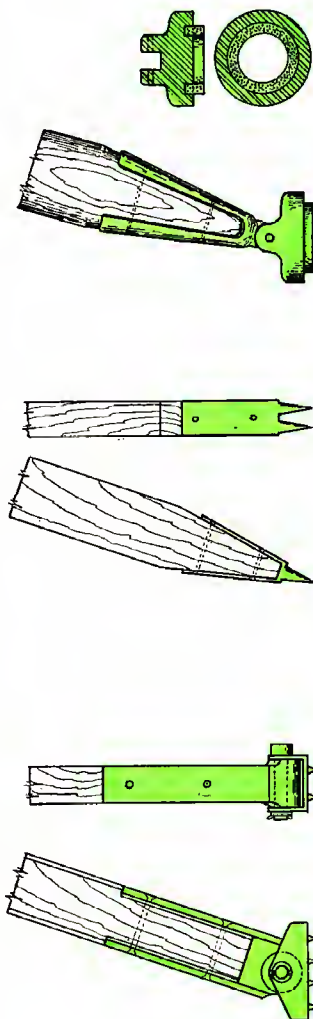


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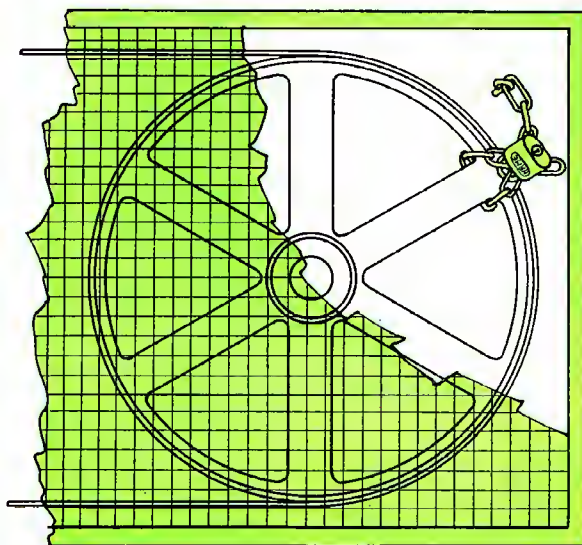
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<u>WORKMENS COMPENSATION</u>
<u>SERVICE BUREAU</u>
<u>SAFETY ENGINEERING DEPARTMENT</u>
Design No. _____ Drawing No. _____ Date _____ Signature _____

SAFETY SHOES FOR LADDERS

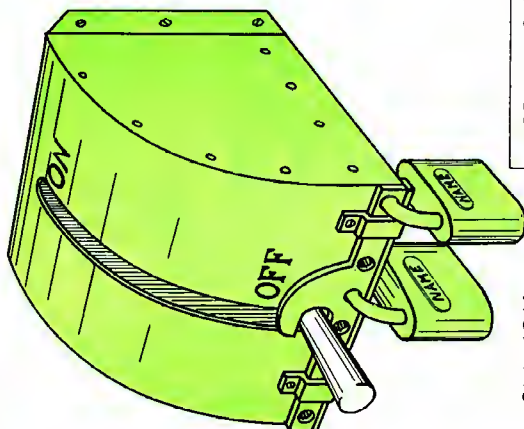
APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
DESIGNED BY: SAFETY
CHECKED BY: SAFETY
APPROVED BY: SAFETY



PADLOCKS AS SAFE GUARDS



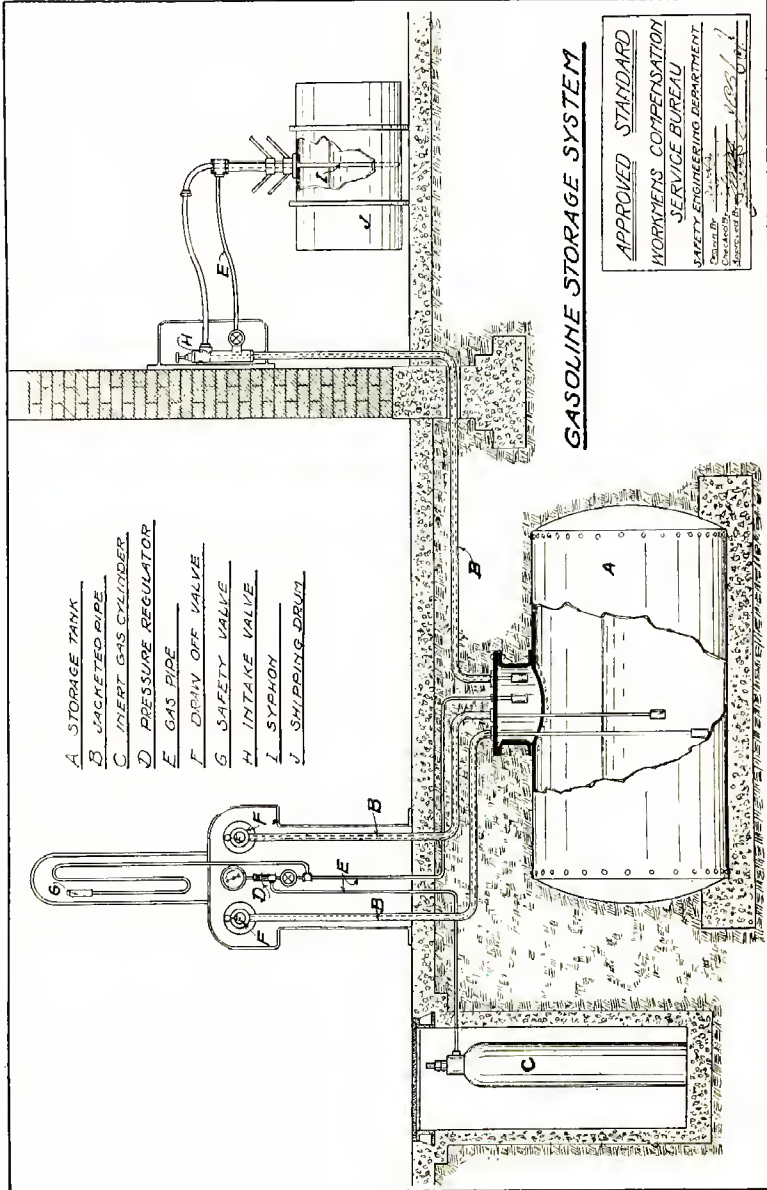
DRIVING PULLEY



SWITCH

APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
 Created By: 2-1-1944
 Approved By: 2-1-1944
 Date: 1944

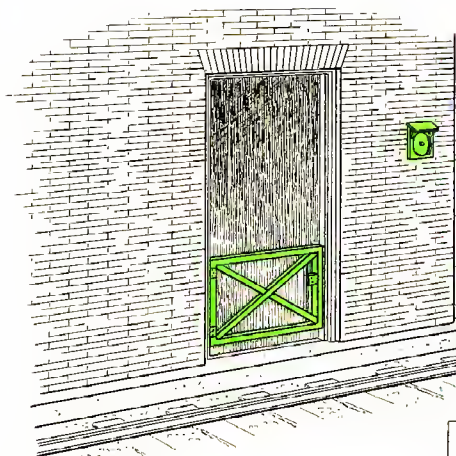
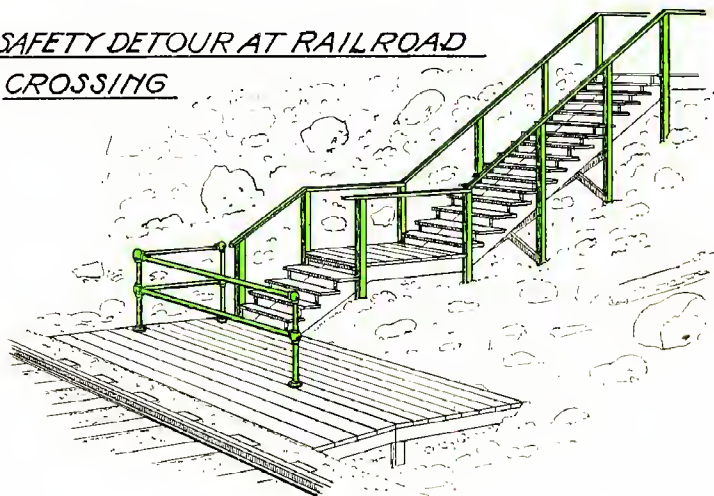
- A STORAGE TANK
B JACKETED PIPE
C INERT GAS CYLINDER
D PRESSURE REGULATOR
E GAS PIPE
F DRAIN OFF VALVE
G SAFETY VALVE
H INTAKE VALVE
I SYPHON
J SHIPPING DRUM



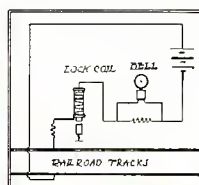
GASOLINE STORAGE SYSTEM

APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
 Drawn By W. H. H. H.
 Checked By W. H. H. H.
 Material and Method W. H. H. H.

SAFETY DETOUR AT RAILROAD CROSSING

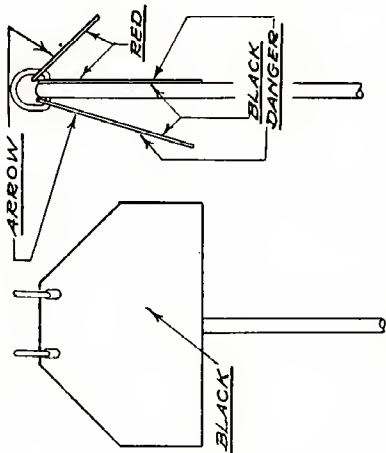
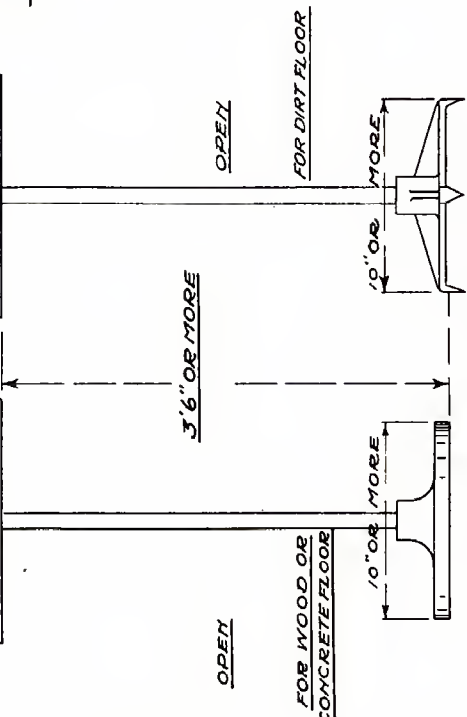
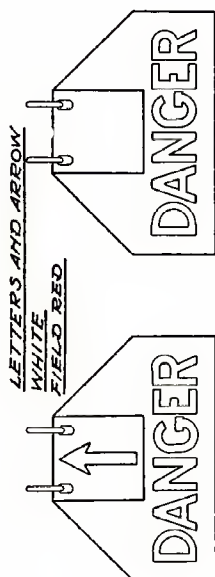


WIRING DIAGRAM



AUTOMATIC GATE AND GONG

APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
 SAFETY ENGINEERING DEPARTMENT
 Drawn By: W. H. F.
 Checked By: W. H. F.
 Approved By: W. H. F.



BOTH SIDES ARE ALIKE
IN ALL POSITIONS

APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
Described by SAFETY
Checked by SAFETY
Approved by SAFETY

MOVABLE DANGER SIGNS

THE UNIVERSAL DANGER
SIGN



ALL DANGER SIGNS TO HAVE WHITE
LETTERS ON A RED FIELD

THE UNIVERSAL SAFETY
SIGN



ALL SAFETY SIGNS SUCH AS EXITS ETC., TO
HAVE WHITE LETTERS ON GREEN FIELD

PART II.
THE MACHINE SHOP

PRINCIPLES OF SAFEGUARDING

The following principles have been adopted for the design of machine safeguards:

1. All power working machines to have gears, sprockets, chains, belts, bands, pulleys, clutches, wheels, shafting, spindles, couplings, counter-weights, revolving or reciprocating parts and all other dangerous points, parts or projections guarded in approved manner.
2. All roller fed machines on which operator's hands come within danger zone to be guarded at the point of operation in approved manner.
3. All machines having a sheering, pressing, squeezing, or cutting action on which operator's hands come within the danger zone to be guarded at the point of operation in approved manner.

The requirements of a safeguard are:

(a) That it afford all possible safety to the operator and surrounding workmen.

(b) That it be, if possible, automatic in its action, application or operation.

(c) That it be, if possible, an integral part of the machine itself.

(d) That it do not materially diminish the output or efficiency of the machine to which it is applied.

(e) Where cone pulley belt shifters are required the type must be properly applicable without interfering with guards of pulleys to which applied. Operating lever of belt shifter is to be so arranged that it will

not necessitate the removal or opening of guard in order to shift belt.

NOTE—The fact that an open guard of angle iron and screen is shown, does not necessarily mean that angle iron and screen is preferred to solid sheet metal—the former is used in many cases because the part guarded can be seen through it.

Boring and Turning Mill (Vertical Motor Driven)

(See Page 145.)

1. All openings in motor exposing rotating or live parts to be guarded.
2. Motor to be controlled by switch and starting box of approved safe type, with control located convenient to operator.
3. Chain drive to be completely enclosed.
4. All power driven gears to be completely enclosed.
5. Universal couplings and connecting shaft to be guarded.
6. Revolving table to be enclosed on edge by stationary band guard with provision for adjusting stock.
7. Counterweight to be guarded for entire travel. Guard to have sealed bottom to prevent weight from dropping.

Boring and Turning Mill (Vertical Belt Driven)

(See Page 146.)

1. Tight and loose pulley belt shifter to be equipped with automatic locking device. (See Pages 225 to 227.)
2. Cone pulley belt shifter to be applied. (See Pages 228 to 231.)

3. All power driven gears to be completely enclosed.
4. Driving belt to be guarded to height of six (6) feet from floor.
5. Universal couplings and shafts to be guarded.
6. Revolving table to be enclosed on edge by stationary band guard with provision for adjusting stock.
7. All counterweights to be guarded for entire travel. Guard to have bottom sealed to prevent weight from dropping.

Tire Turning Mill (Vertical, Motor Driven)

(See Page 147.)

1. All openings in motor exposing rotating or live parts to be guarded.
2. Motor to be controlled by switch and starting box of approved safe type, with control located convenient to operator.
3. Transmission gears to be completely guarded, shifting lever to extend through guard.
4. All other power driven gears, including feed gear and eccentric, to be completely enclosed.
5. Revolving table to be enclosed on edge by stationary band guard with provision for adjusting stock.
6. Tool to be guarded as shown on Page 177.
7. Counterweight to be guarded to a height of six (6) feet from floor.

Locomotive Rod Boring Machine (Motor Driven)

(See Page 148.)

1. All openings in motor exposing rotating or live parts to be covered.
2. Motor to be controlled by switch and starting box of approved safe type.
3. All power driven gears to be completely enclosed.
4. Spindle feed gears to be enclosed with hood guard arranged to permit changing of gears.
5. Safety drill sockets to be used. (See Page 233.)

Bulldozer

(See Page 149.)

1. Driving clutch and all power driven gears to be completely enclosed.
2. Clutch lever to extend through guard and to be provided with automatic locking device. (See Pages 225 to 227.)
3. Exposed shafting to be protected with shaft guard. (See Page 86.)
4. Eccentric to be completely enclosed.
5. Connecting rod and head to be guarded by railing extending entire length of travel. Railing to have opening to admit stock.

Cutting-off Machine (Motor Driven)

(See Page 150.)

1. All openings in motor exposing rotating or live parts to be guarded.
2. Motor to be controlled by switch and starting box of approved safe type, with control located convenient to operator.

3. All power driven gears to be completely enclosed.
4. Clutch to be completely guarded to within one (1) inch of maximum aperture.
5. Feed belt to be completely enclosed.

Double Axle Cutting-off and Centering Machine (Belt Driven)

(See Page 151.)

1. Clutch lever to be equipped with automatic locking device. (See Pages 225 to 227.)
2. Belts to be guarded to height of six (6) feet from floor.
3. Cone pulley belt shifter to be applied. (See Pages 228 to 231.)
4. All power driven gears to be completely enclosed.
5. Centering chucks to be completely enclosed except an opening for stock one (1) inch larger than maximum size.
6. Tools to be guarded as shown on Page 177.

Drill (Belt Driven)

(See Page 152.)

1. Driving belts to be guarded to height of six (6) feet from floor.
2. Tight and loose pulley belt shifter to extend through guard and to be equipped with automatic locking device. (See Pages 225 to 227.)
3. Cone pulley belt shifter to be applied. (See Pages 228 to 231.)
4. All power driven gears to be completely enclosed.
5. Spindle shaft to be guarded as shown.

6. Safety drill sockets to be used. (See Page 233.)
7. Table to be equipped with drill press vise, or clamps, or other provisions to be made to properly secure stock when drilling.

High Duty Drill (Belt Driven)

(See Page 153.)

1. Belts to be guarded to height of six (6) feet from floor.
2. Tight and loose pulley belt shifter to extend through guard and to be equipped with automatic locking device. (See Pages 225, 226.)
3. Cone pulley belt shifter to be applied. (See Pages 228 to 231.)
4. All power driven gears to be completely enclosed.
5. Safety drill socket to be used. (See Page 233.)
6. Table to be equipped with drill press vise, or clamps, or other provisions to be made to properly secure stock when drilling.

Friction Drill (Vertical, Motor Driven)

(See Page 154.)

1. Motor, driving belt and friction cones to be completely enclosed.
2. Motor to be controlled by switch and starting box of approved safe type, with control located convenient to operator.
3. Safety drill socket to be used. (See Page 233.)
4. Table to be equipped with drill press vise, or clamps, or other provisions to be made to properly secure stock when drilling.

Upright Self-Feeding Drill (Hand or Belt Driven)

(See Page 155.)

1. Belt to be guarded to a height of six (6) feet from floor.
2. Tight and loose pulley belt shifter or clutch lever to extend through guard and to be equipped with automatic locking device. (See Pages 225 to 227.)
3. Drill press spindles to be guarded.
4. Safety drill sockets to be used. (See Page 233.)
5. Table to be equipped with drill press vise, or clamps, or other provisions to be made to properly secure stock when drilling.

Spindle Rail Drilling Machine (Motor Driven)

(See Page 156.)

1. All openings in motor exposing rotating or live parts to be covered.
2. Motor to be controlled by switch and starting box of approved safe type, with control located convenient to operator.
3. Driving belt and feed belts to be guarded to height of six (6) feet from floor.
4. All power driven gears to be completely enclosed.
5. Counterweight to be enclosed from floor to top of weight when in extreme upward position.
6. Safety drill sockets to be used. (See Page 233.)

Universal Adjustable Drill (Belt Driven)

(See Page 157.)

1. Tight and loose pulley belt shifter to extend through guard and to be equipped with automatic locking device. (See pages 225 to 227.)
2. Belts to be guarded to a height of six (6) feet from floor.
3. Cone pulley belt shifter to be applied. (See Pages 228 to 231.)
4. All power driven gears to be completely enclosed.
5. Universal couplings and connecting shafts to be guarded.
6. Safety drill sockets to be used. (See Page 233.)
7. Table to be equipped with drill press vise, or clamps, or other provisions to be made to properly secure stock when drilling.

Sensitive Drilling Machine (Belt Driven)

(See Page 158.)

1. Tight and loose pulley belt shifter pedal to be equipped with locking device as shown.
2. Main drive belt and all other belts and pulleys to be guarded to a height of six (6) feet from floor.
3. All power driven gears to be completely enclosed.
4. Spindle to be guarded.
5. Safety drill socket to be used. (See Page 233.)
6. Table to be equipped with drill press vise, or clamps, or other provisions to be made to properly secure stock when drilling.

Hole Hog Multiple Drill (Vertical Belt Driven)

(See Page 159.)

1. Tight and loose pulley belt shifter or clutch lever to be equipped with automatic locking device. (See Pages 225 to 227.)
2. Driving belts to be guarded to six (6) feet from floor.
3. Cone pulley belt shifter to be applied. (See Pages 228 to 231.)
4. Feed belt to be completely enclosed.
5. Driving spiral to be completely encased by hinged screen guard.
6. Foot lever to act as automatic cut-off for feed.
7. Safety drill sockets to be used. (See Page 233.)
8. Counterweight to be enclosed from floor to top of weight when in extreme upward position.
9. Table to be equipped with drill press vise, or clamps, or other provisions to be made to properly secure stock when drilling.

High Speed Multiple Drill (Vertical, Belt Driven)

(See Page 160.)

1. Belts to be guarded to a height of six (6) feet.
2. Tight and loose pulley belt shifter to extend through guard and to be equipped with automatic locking device. (See Pages 225 to 227.)
3. Cone pulley belt shifter to be applied. (See Pages 228 to 231.)
4. All power driven gears to be completely enclosed.
5. Counterweight to be enclosed from floor to top of weight when in highest position.
6. Openings in spindle case to be covered.

7. Safety drill sockets to be used. (See Page 233.)
8. Table to be equipped with drill press vise, or clamps, or other provisions to be made to properly secure stock when drilling.

High Speed Multiple Drill (Vertical, Belt Driven) (See Page 161.)

1. Driving belts to be enclosed to a height of six (6) feet from floor.
2. Tight and loose pulley belt shifter to be equipped with automatic locking device. (See Pages 225 to 227.)
3. Cone pulley belt shifter to be applied. (See Pages 228 to 231.)
4. All power driven gears to be completely enclosed.
5. Feed-rod to be enclosed to a height of six (6) feet.
6. Openings in spindle case to be covered.
7. Safety drill sockets to be used. (See Page 233.)
8. Table to be equipped with drill press vise, or clamps, or other provisions to be made to properly secure stock when drilling.

Multiple Spindle Drill (Horizontal, Belt Driven) (See Page 162.)

1. Belt shifter or clutch lever to extend through guard and to be equipped with automatic locking device. (See Pages 225 to 227.)
2. Belt to be guarded to a height of six (6) feet from floor.
3. All power driven gears to be completely enclosed.
4. Openings in sides of spindle case to be covered.
5. Safety drill sockets to be used. (See Page 233.)

Radial Drill (Belt Driven)

(See Page 163.)

1. All belts to be guarded to a height of six (6) feet.
2. Tight and loose pulley belt shifter to extend through guard and to be equipped with automatic locking device. (See Pages 225 to 227.)
3. Cone pulley belt shifter to be applied.
4. All power driven gears to be completely enclosed.
5. Safety drill sockets to be used. (See Page 233.)
6. Table to be equipped with drill press vise, or clamps, or other provisions to be made to properly secure stock when drilling.

Automatic Gear Cutting Machine (Belt Driven)

(See Page 164.)

1. Tight and loose pulley belt shifter or clutch lever to be equipped with automatic locking device. (See Pages 225 to 227.)
2. Driving belt to be guarded to a height of six (6) feet from floor.
3. Cone pulley belt shifter to be applied. (See Pages 228 to 231.)
4. All power driven gears to be completely enclosed.
5. Gear hob to be enclosed as completely as possible without interfering with the cutting.
6. Space between arms on hand wheel to be covered as shown.

Gear Generating Machine (Motor Driven)

(See Page 165.)

1. All openings in motor exposing rotating or live parts to be completely covered.
2. Motor to be controlled by switch and starting box of approved safe type, with control located convenient to operator.
3. All power driven gears to be completely enclosed.
4. Counterweight to be enclosed from floor to top of weight when in highest position.

Car Wheel Grinder

(See Page 166.)

1. Clutch lever to be equipped with automatic locking device. (See Pages 225 to 227.)
2. All belts to be guarded to height of six (6) feet from floor.
3. Grinding wheels to be guarded as shown on Pages 168 to 173.
4. All power driven gears to be completely enclosed.

Guide Bar Grinder (Motor Driven)

(See Page 167.)

1. All openings in motor exposing rotating or live parts to be covered.
2. Motor to be controlled by switch and starting box of approved safe type, with control located convenient to operator.
3. Driving belts to be completely enclosed.
4. All power driven gears to be completely enclosed.

5. Exposed shaft to be covered with shaft guard.
(See Page 86.)
6. Grinding wheel to be guarded.
7. Wheels to be provided with substantial retaining hoods or band guards covering as much of the wheels as possible and of sufficient strength to retain fragments in case of explosion.
8. Openings in bed to be covered with substantial perforated metal guard, securely fastened.
9. Table to have eighteen (18) inches clearance from all stationary objects when in extreme positions. Otherwise space to be permanently and effectively barred against passage.

Tool Grinders, Center Grinders, all other Emery and Abrasive Wheel (Belt and Motor Driven)

(See Pages 168, 169.)

1. Tight and loose pulley belt shifter or clutch lever to be equipped with automatic locking device.
2. Belt to be enclosed to height of six (6) feet from floor.
3. If motor driven, all openings in motor exposing rotating or live parts to be covered and motor to be controlled by switch and starting box of approved safe type, with control located convenient to operator.
4. Wheels eight (8) inches or more in diameter whether used wet or dry, to be mounted with safety flanges, provided that operation for which wheels are used and shape of wheels do not make this impractical.

5. Wheels to be provided with substantial retaining hoods (or, when such would interfere with operation, with band guards) covering as much of the wheel as possible and of sufficient strength to retain fragments in case of explosion. (See Pages 172, 173.)
6. Plate glass shield to be attached above point of grinding contact. (See Page 168.)
7. Arbor ends to be protected. (See Pages 168, 172.)
8. Dry wheels to be provided with efficient exhaust system, capable of drawing off all dust particles. See Page 168.)
9. All wheels to be operated at a speed not to exceed that recommended by the manufacturer.
10. Speed limit stops to be applied. (See Page 174.)

Safety Flanges

(See Pages 170, 171.)

Grinding Wheel Guards

(See Pages 172, 173.)

Grinding Wheel Limit Stop

(See Page 174.)

Power Hammer (Belt Driven)

(See Page 175.)

1. Driving pulley and idler to be completely enclosed.
2. Idler to be so designed that gravity holds it in idle position.
3. Eccentric and hammer to be completely enclosed to the height of maximum lift of hammer.
4. Treadle to be equipped with safety locking device as shown.

Steam Hammer

(See Page 176.)

1. Operating levers to be equipped with automatic locking devices.
2. Scale guard to be applied at point of operation.
3. Locking device for ram to be provided and used when changing dies.
4. If steam pipe leading to or from cylinder is within seven (7) feet of floor level, it is to be effectively insulated by non-conducting material.

Engine Lathe (Belt Driven)

(See Page 177.)

1. Tight and loose pulley belt shifter or clutch lever to be equipped with automatic locking device. (See Pages 225 to 227.)
2. Cone pulley, belt and back gears to be enclosed to a height of six (6) feet from floor. Back gear shifting lever to extend through guard.
3. Cone pulley belt shifter to be applied. (See Pages 228 to 231.)
4. All other power driven gears to be completely enclosed.
5. Chuck to be preferably of a safety type and to be enclosed on edges by stationary band guard with provision for adjusting stock. (See Page 184.)
6. Lathe dogs to be of a safety type or enclosed. (See Pages 185, 186.)
7. Tool to be guarded at point of contact as shown.

Engine Lathe (Motor Driven)

(See Page 178.)

1. All openings in motor exposing rotating or live parts to be covered.
2. Motor to be controlled by switch and starting box of approved safe type, with control located convenient to operator.
3. Brake wheel to be enclosed and brake attachment applied with lever extending through enclosure.
4. All power driven gears to be completely enclosed.
5. Chuck to be preferably of a safety type and to be enclosed on edges by stationary band guard with provision for adjusting stock. (See Page 184.)
6. Lathe dogs to be of a safety type or enclosed. (See Pages 185, 186.)
7. Tool to be guarded at point of contact. (See Page 177.)

Driving Wheel Lathe (Belt Driven)

(See Page 179.)

1. Tight and loose pulley belt shifter or clutch lever to be equipped with automatic locking device. (See Pages 225 to 227.)
2. Cone pulley and belt to be guarded to height of six (6) feet from floor.
3. Cone pulley belt shifter to be applied. (See Pages 228 to 231.)
4. All power driven gears to be completely enclosed.
5. Both chucks to be enclosed on edges by stationary band guard with provision for adjusting stock.
6. Tool to be guarded as shown on Page 177.)

Tire Turning Lathe (Motor Driven)

(See Page 180.)

1. All openings in motor which expose rotating or live parts to be enclosed.
2. Motor to be controlled by switch and starting box of approved safe type, with control located convenient to operator.
3. Chain drive to be completely enclosed.
4. Shafting to be covered with shaft guard.
5. All power driven gears to be completely enclosed.
6. Chuck to be of a safety type and to be enclosed on edges by stationary band guard with provision for adjusting stock. (See Page 184.)
7. Lathe dogs to be of a safety type or enclosed.
8. Tool to be guarded at point of contact. (See Page 177.)

Heavy Back Geared Lathe (Motor Driven)

(See Page 181.)

1. All openings in motor exposing rotating or live parts to be covered.
2. Motor to be controlled by switch and starting box of approved safe type, with control located convenient to operator.
3. Chain drive to be completely enclosed.
4. All power driven gears to be completely enclosed.
5. All exposed power driven shafting to be covered with shaft guard.
6. Chuck to be preferably of a safety type and to be enclosed on edges by stationary band guard with provision for adjusting stock. (See Page 184.)

7. Lathe dogs to be of a safety type or enclosed. (See Pages 185, 186.)
8. Tool to be guarded at point of contact. (See Page 177.)

Speed Lathe (Belt Driven)

(See Page 182.)

1. Tight and loose pulley belt shifter or clutch lever to be equipped with automatic locking device.
2. Belt to be guarded to a height of six (6) feet from floor.
3. Cone pulley belt shifter to be applied.
4. Chuck to be preferably of a safety type and to be enclosed on edges by stationary band guard with provision for adjusting stock. (See Page 184.)
5. Lathe dogs to be of a safety type or enclosed. (See Pages 185, 186.)

Universal Hollow Turret Lathe (Motor Driven)

(See Page 183.)

1. All openings in motor exposing rotating or live parts to be covered.
2. Motor to be controlled by switch and starting box of approved safe type, with control located convenient to operator.
3. All power driven gears to be completely enclosed.
4. Chuck to be preferably of a safety type and to be enclosed on edges by a stationary band guard with provision for adjusting stock. (See (Page 184.)
5. Stock to be guarded for entire length as shown.

Safety Chuck

(See Page 184.)

Safety Lathe Dog

(See Page 185.)

Lathe Dog Guard

(See Page 186.)

Plain Milling Machine (Belt Driven)

(See Page 187.)

1. Tight and loose pulley belt shifter or clutch lever to be equipped with automatic locking device. (See Pages 225 to 227.)
2. Driving and feed belts to be guarded to height of six (6) feet from floor.
3. Cone pulley belt shifter to be applied. (See Pages 228 to 231.)
4. All power driven gears to be guarded.
5. Telescoping universal coupling shaft to be completely enclosed.
6. Cutter head to be guarded as shown.

Portable Milling Machine (Belt Driven)

(See Page 188.)

1. All openings in motor exposing rotating or live parts to be covered.
2. Motor to be controlled by switch and starting box of approved safe type, with control located convenient to operator.
3. All belts to be guarded to height of six (6) feet from floor.

4. Cone pulley belt shifter to be applied. (See Pages 228 to 231.)
5. Driving shaft to be guarded by telescoping guard as shown.
6. All power driven gears to be completely enclosed.

Vertical Milling Machine (Belt Driven)

(See Page 189.)

1. Tight and loose pulley belt shifter or clutch lever to be equipped with automatic locking device. (See Pages 225 to 227.)
2. All belting to be guarded to a height of six (6) feet from floor.
3. Cone pulley belt shifter to be applied. (See Pages 228 to 231.)
4. All power driven gears to be completely enclosed.
5. Telescoping shafts and universal couplings to be guarded as shown.

Heavy Vertical Milling Machine (Motor Driven)

(See Page 190.)

1. All openings in motor exposing rotating or live parts to be covered.
2. Motor to be controlled by switch and starting box of approved safe type, with control located convenient to operator.
3. All power driven gears to be completely enclosed.
4. Feed belt pulley to be guarded, gear shifting lever to extend through guard.
5. Main spindle to be guarded with telescoping guard.

6. Counterweight to be enclosed from floor to top of weight when in extreme upward position.
7. Tool to be guarded at point of contact. (See Page 187.)

Pipe Threading and Cutting Machine (Belt Driven)

(See Page 191.)

1. Tight and loose pulley belt shifter or clutch lever to be equipped with automatic locking device. (See Pages 225 to 227.)
2. Belt to be guarded to height of six (6) feet from floor.
3. Cone pulley belt shifter to be applied. (See Pages 228 to 231.)
4. All power driven gears to be completely enclosed.
5. Gear shifting lever to extend through guard.
6. Chuck to be preferably of a safety type and to be enclosed on edges by stationary band guard with provision for adjusting stock. (See Page 184.)
7. Centering vise to be guarded as shown.
8. Where peripheral speed of stock exceeds six (6) feet a second, stock to be guarded. (See Page 183.)

Pipe Bending Machine (Belt Driven)

(See Page 192.)

1. Tight and loose pulley belt shifter or clutch lever to be equipped with automatic locking device. (See Pages 225 to 227.)
2. Driving belts to be guarded to a height of six (6) feet from floor.

3. Reversing lever to be extended through guard.
4. All power driven gears to be completely enclosed.
5. Roll shafts to be guarded.
6. Railing of standard height to be placed within six (6) inches of rolls.

Planer (Belt Driven)

(See Page 193.)

1. Driving belt to be guarded to height of six (6) feet from floor.
2. Tight and loose pulley belt shifter or clutch lever to be equipped with automatic locking device. (See Pages 225 to 227.)
3. Feed eccentric to be guarded.
4. All power driven gears to be completely enclosed.
5. Openings in planer bed to be covered by substantial perforated metal guard securely fastened.
6. Table to have eighteen (18) inches clearance from all stationary objects when in extreme positions. Otherwise space to be permanently and effectively barred against passage.
7. Tool to be guarded at point of contact. (See Page 177.)

Vertical Spindle and Rotary Planing Machine

(Motor Driven)

(See Page 194.)

1. All openings in motor exposing rotating or live parts to be covered.
2. Motor to be controlled by switch and starting box of approved safe type, with control located convenient to operator.

3. Belts to be guarded to a height of six (6) feet from floor.
4. All power driven gears to be completely enclosed.
5. Cutter to be guarded as shown.
6. Openings in bed to be guarded by substantial perforated metal guard, securely fastened.
7. Table to have eighteen (18) inches clearance from all stationary objects when in extreme position. Otherwise space to be permanently and effectively barred against passage.

Hydraulic Wheel Press

(See Page 195.)

1. Driving belts to be guarded to a height of six (6) feet from floor.
2. Tight and loose pulley belt shifter to be equipped with automatic locking device. (See Pages 225, 226.)
3. Eccentrics to be included in driving belt guard.
4. Cylinder and all cast iron fittings containing pressure to be designed with a safety factor of ten.

Stopper Press

(See Page 196.)

1. Clutch lever to be equipped with an automatic locking device. (See Pages 225, 226.)
2. Driving belt and pulley to be guarded to height of six (6) feet from floor.
3. All power driven gears to be completely enclosed.
4. Belt and pulleys operating ejector rolls to be guarded.
5. Feed ratchet to be guarded.

Straight Sided Press (Double Geared, Belt Driven)

(See Page 197.)

1. Driving belt and pulley to be guarded to height of six (6) feet from floor.
2. Tight and loose pulley belt shifter to extend through guard and to be equipped with automatic locking device. (See Pages 225 to 227.)
3. All power driven gears to be completely enclosed.
4. Connecting rod to be guarded.
5. Ram crank to be guarded.
6. Counterweight to be guarded from floor to top of weight when in extreme upward position.
7. Press to be equipped with approved automatic device at point of operation preventing operator's hands from coming within danger zone. (See Pages 203 to 213.)

Straight Sided Trimming Press (Motor Driven)

(See Page 198.)

1. All openings in motor exposing rotating or live parts to be covered.
2. Motor to be controlled by switch and starting box of approved safe type, with control located convenient to operator.
3. All power driven gears and fly-wheels to be completely guarded.
4. Clutch to be completely guarded.
5. Ram crank to be guarded.
6. Side tool, crank and connecting rod to be guarded.
7. Press to be equipped with approved automatic device at point of operation preventing operator's hands from coming within danger zone. (See Pages 203 to 213.)

Straight Sided Stamping Press (Belt Driven)

(See Page 199.)

1. Tight and loose pulley belt shifter or clutch lever to be equipped with automatic locking device. (See Pages 225 to 227.)
2. Driving belt to be guarded to height of six (6) feet from floor.
3. Pulleys and fly-wheels to be completely enclosed.
4. All power driven gears to be completely enclosed.
5. Crank to be guarded.
6. Clutch to be guarded.
7. Press to be equipped with approved automatic device at point of operation preventing operator's hands from coming within the danger zone. (See Pages 203 to 213.)

Dial Feed Press (Motor Driven)

(See Page 200.)

1. All openings in motor exposing rotating or live parts to be covered.
2. Motor to be controlled by switch and starting box of approved safe type, with control located convenient to operator.
3. Driving belt and pulleys to be completely guarded. Lever to extend through guard.
4. All power driven gears to be completely enclosed.
5. Ram crank and connecting rod to be guarded.
6. Dial feed crank and connecting rod to be completely guarded.
7. Press to be equipped with approved automatic device at point of operation preventing operator's hands from coming within the danger zone. (See Pages 203 to 213.)

Inclinable Power Press (Roll Feed, Belt Driven)

(See Page 201.)

1. Driving pulley and belt to be guarded to height of six (6) feet from floor.
2. Clutch lever to be equipped with automatic locking device. (See Pages 225 to 227.)
3. Ram crank to be guarded.
4. Feed crank and connecting rod to be completely guarded.
5. All power driven gears to be completely enclosed.
6. Feed rolls to be guarded.
7. Press to be equipped with approved automatic device at point of operation preventing operator's hands from coming within the danger zone. (See Pages 203 to 213.)

Inclinable Stamping Press (Motor Driven)

(See Page 202.)

1. All openings in motor exposing rotating or live parts to be covered.
2. Motor to be controlled by switch and starting box of approved safe type, with control located convenient to operator.
3. Driving belt and pulleys to be completely guarded. Idler handle to extend through guard.
4. Crank to be guarded.
5. Press to be equipped with approved automatic device at point of operation preventing operator's hands from coming within the danger zone. (See Pages 203 to 213.)
6. Where side tool is used, eccentric and tool are to be guarded in similar manner.

Stamping Press Guards

(See Pages 203 to 212.)

Stamping Press Feeders and Ejectors

(See Page 213.)

Rail Ending Machine (Motor Driven)

(See Page 214.)

1. Entire machine and motor to be enclosed with easily removable guards.
2. Motor to be controlled by switch and starting box of approved safe type, with control located convenient to operator.

Extra Heavy Slotting Machine (Belt Driven)

(See Page 215.)

1. Belt to be guarded to a height of six (6) feet from floor.
2. Cone pulley belt shifter to be applied. (See Pages 228 to 231.)
3. Clutch lever to be equipped with automatic locking device.
4. All power driven gears to be completely enclosed.
5. Ram eccentric to be guarded.
6. Keyed feed shaft to be guarded.

Plate Bending Rolls (Motor Driven)

(See Page 216.)

1. All openings in motor exposing rotating or live parts to be covered.
2. Motor to be controlled by switch and starting box of approved safe type, with control located convenient to operator.

3. All exposed shafting to be covered with shaft guard.
4. All power driven gears to be completely enclosed.
5. Rolls to be completely covered with a heavy plate, leaving small slot for feeding and ejecting.

Plate Straightening Rolls (Belt Driven)

(See Page 217.)

1. Driving belts to be guarded to height of six (6) feet from floor.
2. Pulleys and clutches to be completely guarded.
3. Clutch lever to extend through guard and to be provided with automatic locking device.
4. All power driven gears to be completely enclosed.
5. Rolls to be completely covered with heavy plate, allowing small slots for feeding and ejecting.

Combination Cold Saw Cutting-off Machine (Motor Driven)

(See Page 218.)

1. All openings in motor exposing rotating or live parts to be covered.
2. Motor to be controlled by switch and starting box of approved safe type, with control located convenient to operator.
3. Chain drive to be completely enclosed.
4. Friction disc to be completely enclosed.
5. Saw to be equipped with adjustable guard covering all parts exposed under given operations.

Power Hack Saw (Motor Driven)

(See Page 219.)

1. All openings in motor exposing rotating or live parts to be covered.
2. Motor to be controlled by switch and starting box of approved safe type, with control located convenient to operator.
3. All power driven gears to be completely enclosed.
4. Starting lever and automatic tripping rod to be extended through guard.

Shaper (Belt Driven)

(See Page 220.)

1. Tight and loose pulley belt shifter or clutch lever to be equipped with automatic locking device. (See Pages 225 to 227.)
2. Driving belt and pulley to be guarded to height of six (6) feet from floor.
3. Cone pulley belt shifter to be applied. (See Pages 228 to 231.)
4. Feed crank to be guarded.
5. Tool to be guarded as shown.
6. Ram to have eighteen (18) inches clearance from all stationary objects when in extreme position. Otherwise space to be permanently and effectively barred against passage.

Alligator Shears (Motor Driven)

(See Page 221.)

1. All openings in motor exposing rotating or live parts to be covered.
2. Motor to be controlled by switch and starting box of approved safe type, with control located convenient to operator.

3. All power driven gears to be completely enclosed.
4. Exposed shaft to be covered with shaft guard.
(See Page 86.)

Rotary Beveling Shears (Motor Driven)

(See Page 222.)

1. All openings in motor exposing rotating or live parts to be covered.
2. Motor to be controlled by switch and starting box of approved safe type, with control located convenient to operator.
3. All power driven gears to be completely enclosed.

Six Spindle Nut Tapper (Motor Driven)

(See Page 223.)

1. All openings in motor exposing rotating or live parts to be covered.
2. Motor to be controlled by switch and starting box of approved safe type, with control located convenient to operator.
3. Chain drive to be completely enclosed.
4. All power driven gears to be completely enclosed.
5. Gear shifting lever to extend through guard.
6. Extension of spindle shafts to be guarded to a height of six (6) feet from floor.

Flue Welding Machine (Belt Driven)

(See Page 224.)

1. Belt to be guarded to a height of six (6) feet from floor.
2. Tight and loose pulley belt shifter to be extended through guard and to be equipped with automatic locking device.
3. Fly-wheel to be enclosed by belt guard.
4. All gears and cutters to be completely enclosed.
5. Driving shaft to be covered with shaft guard.
6. Counterweight to be securely fastened on arm and provision made that it cannot fall off.

Tight and Loose Pulley Belt Shifters and Locking Devices

(See Pages 225, 226, 227.)

Cone Pulley Belt Shifters

(See Pages 228 to 231.)

Safety Levers

(See Page 232.)

Safety Drill Socket

(See Page 233.)

Rack for Chucks and Face Plates

(See Page 234.)

Racks for Bar Stock and Pipes

(See Page 235.)

Bin for Pipe Fittings and Small Castings

(See Page 236.)

Shop Furniture

(See Page 237.)

Chipping Shield

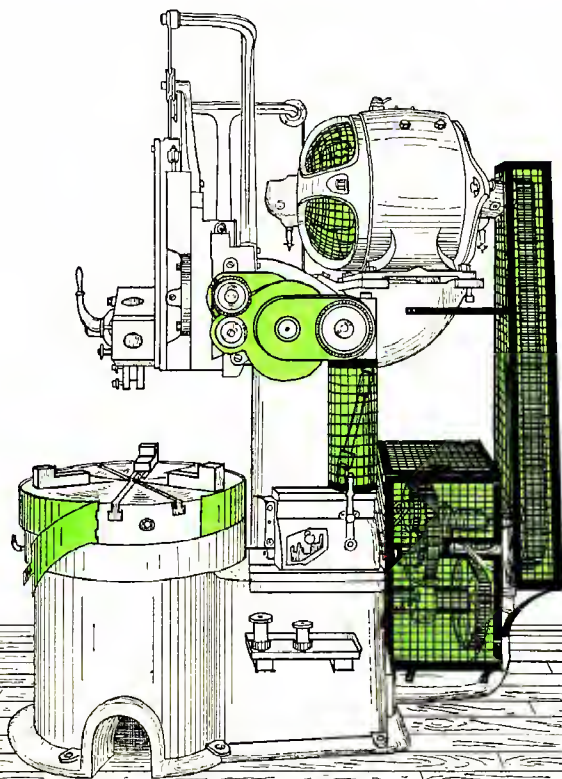
(See Page 238.)

General Machine Shop Plan

(See Page 239.)

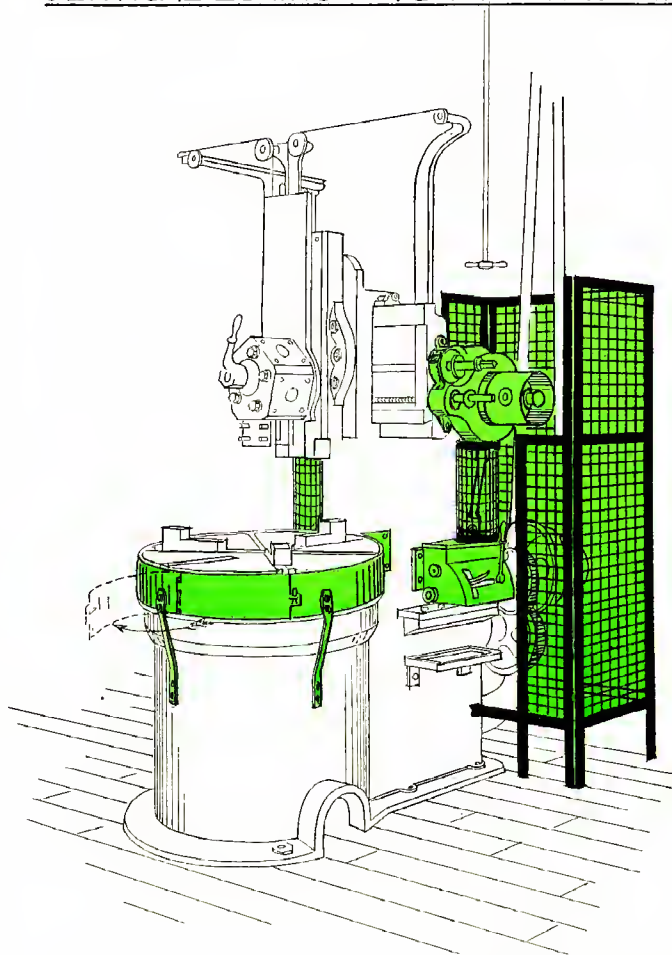
1. All straight line, turning, milling, grinding and tempering operations are grouped.
2. Tool room is centrally located.
3. Ample space is allowed around planers for the handling of large castings.
4. Benches, bench lathes and universal grinders are placed near windows.
5. The engine and bench lathes are driven by countershaft for efficiency while all other tools are direct motor driven.
6. Metal treating baths, tempering furnaces and grinders are equipped with adequate exhaust hoods.
7. All spaces between machines less than eighteen (18) inches are permanently barred against passage.
8. All shops should be equipped with a small portable crane.
9. Sanitary locker room, wash basins and latrines should be provided.

VERTICAL BORING AND TURNING MILL



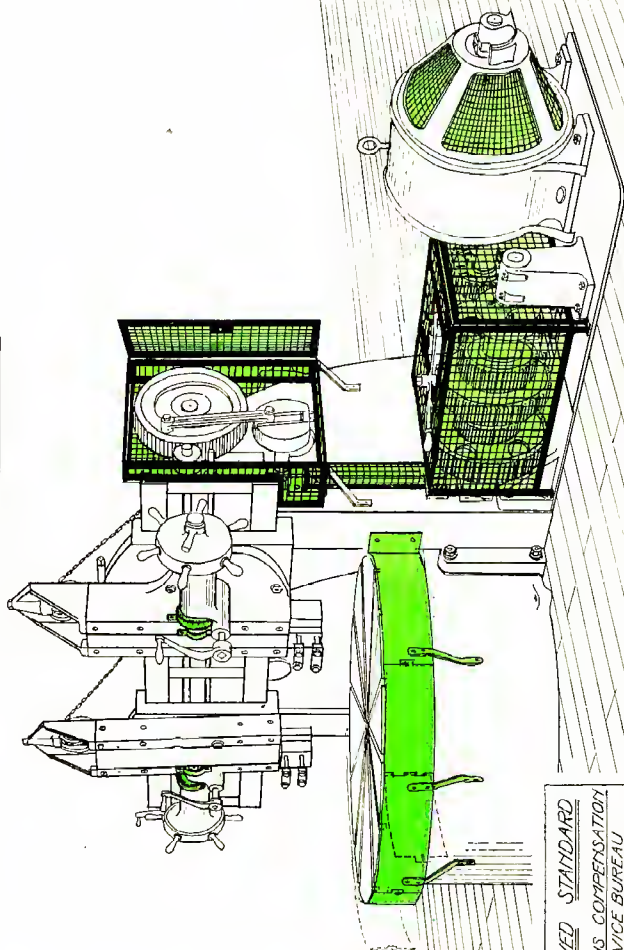
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SAFETY ENGINEERING DEPARTMENT
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Checked By S.P.S.
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VERTICAL BORING AND TURNING MACHINE



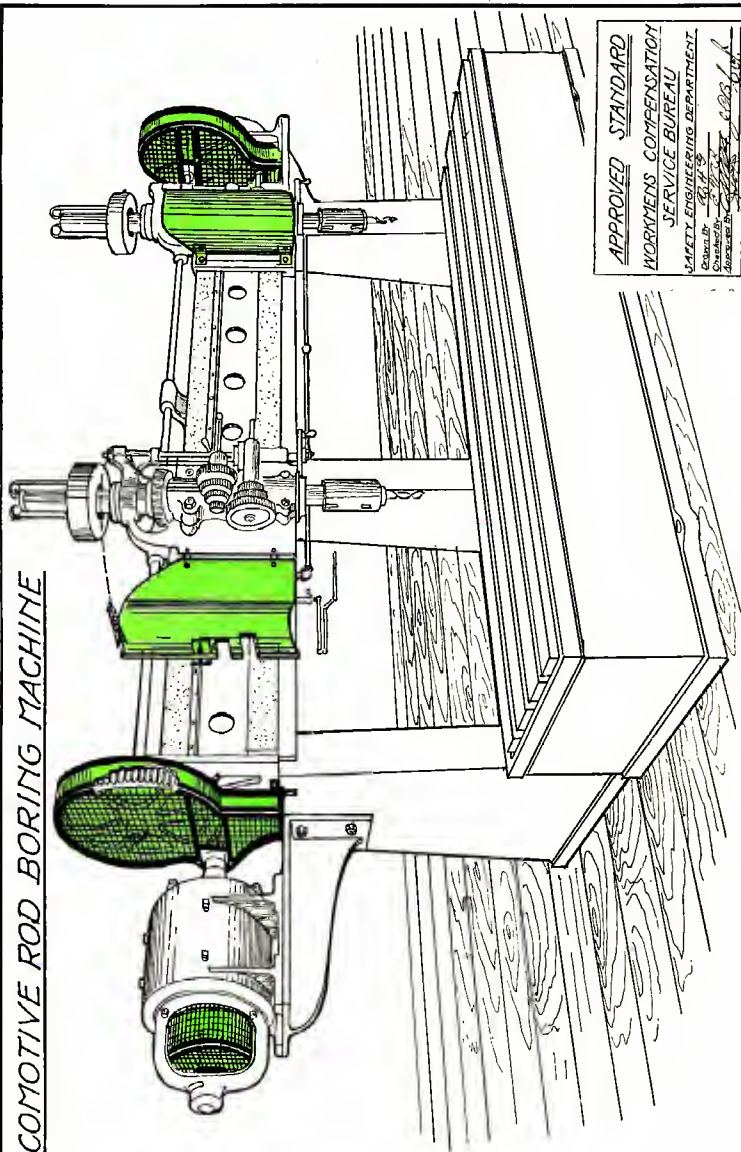
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TIRE TURNING MILL



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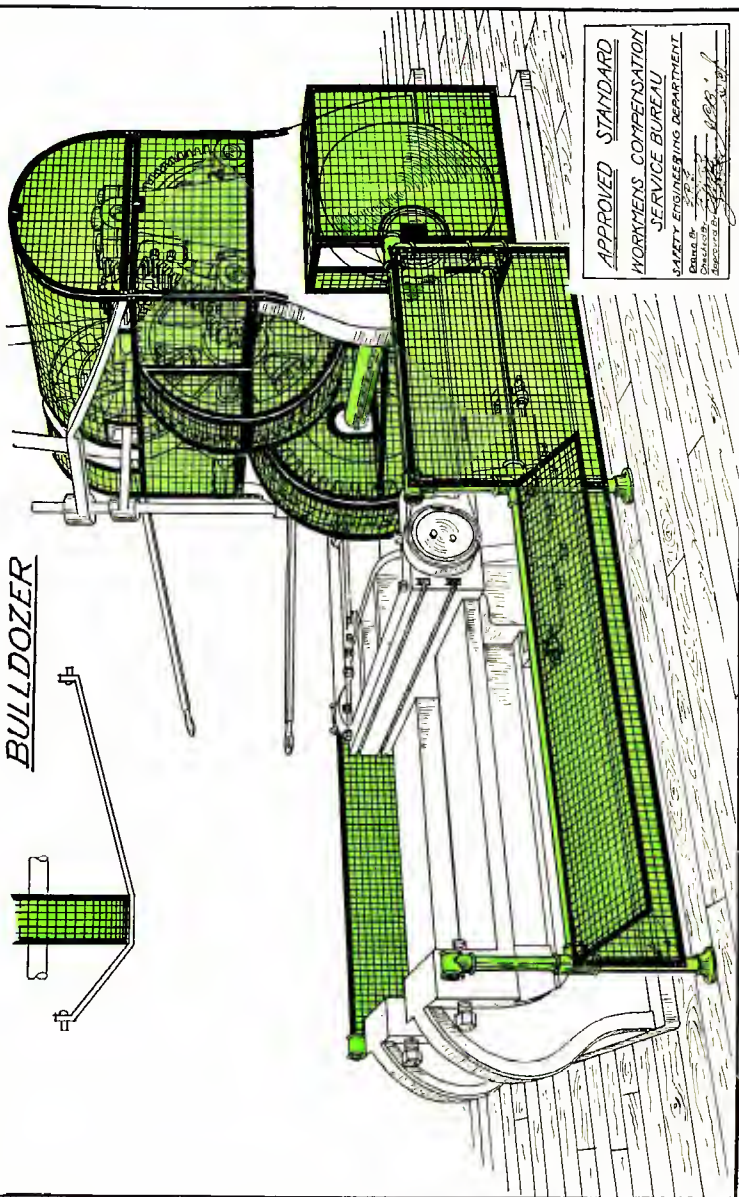
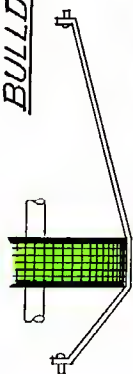
LOCOMOTIVE ROD BORING MACHINE



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 APPROVED BY: J. H. G.
 DATE: 10/1/19

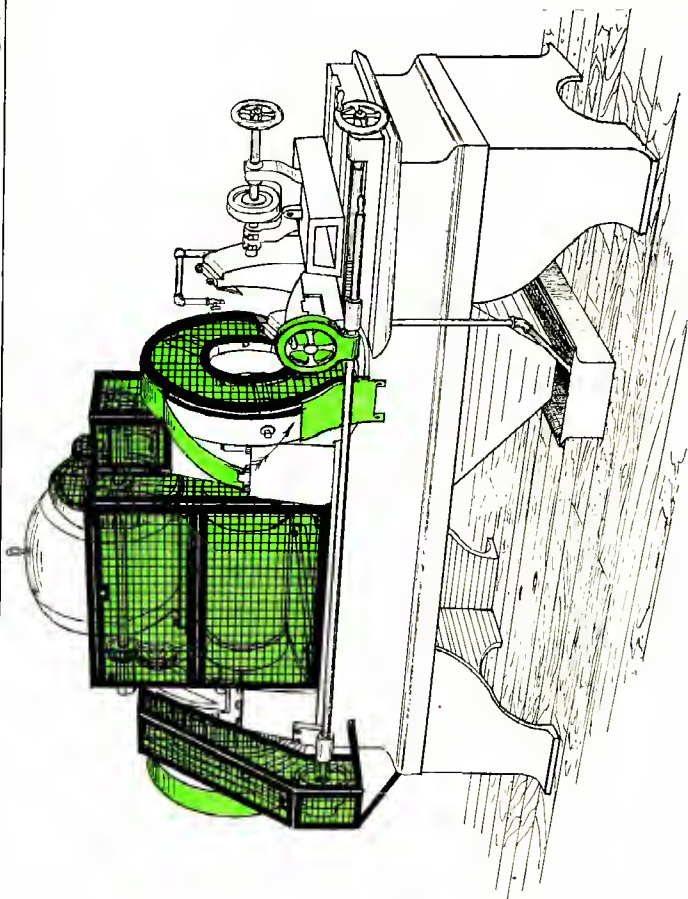
BULLDOZER



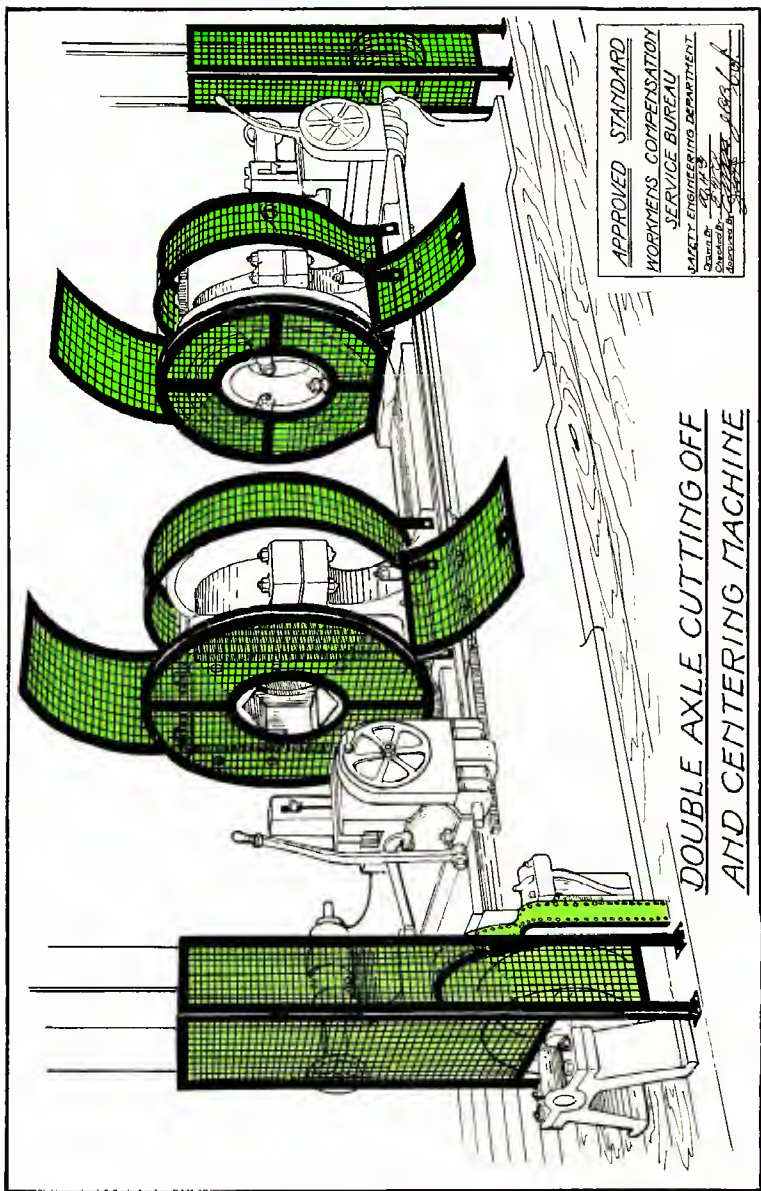
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MOTOR DRIVEN CUTTING OFF MACHINE

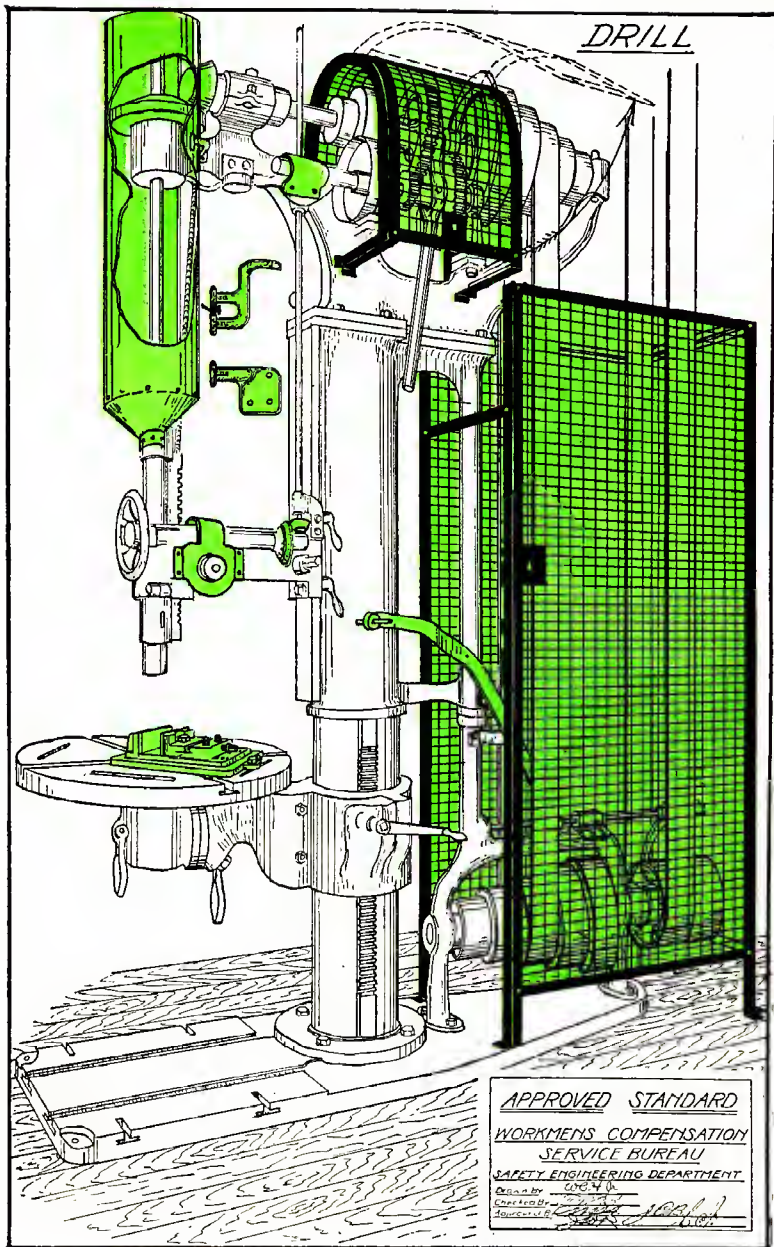


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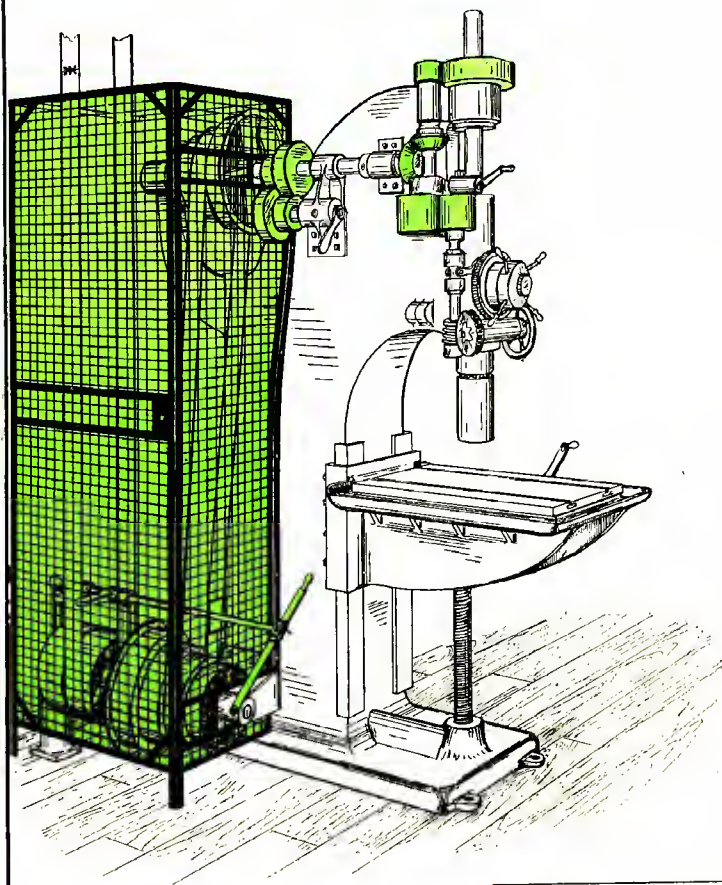


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DOUBLE AXLE CUTTING OFF
AND CENTERING MACHINE



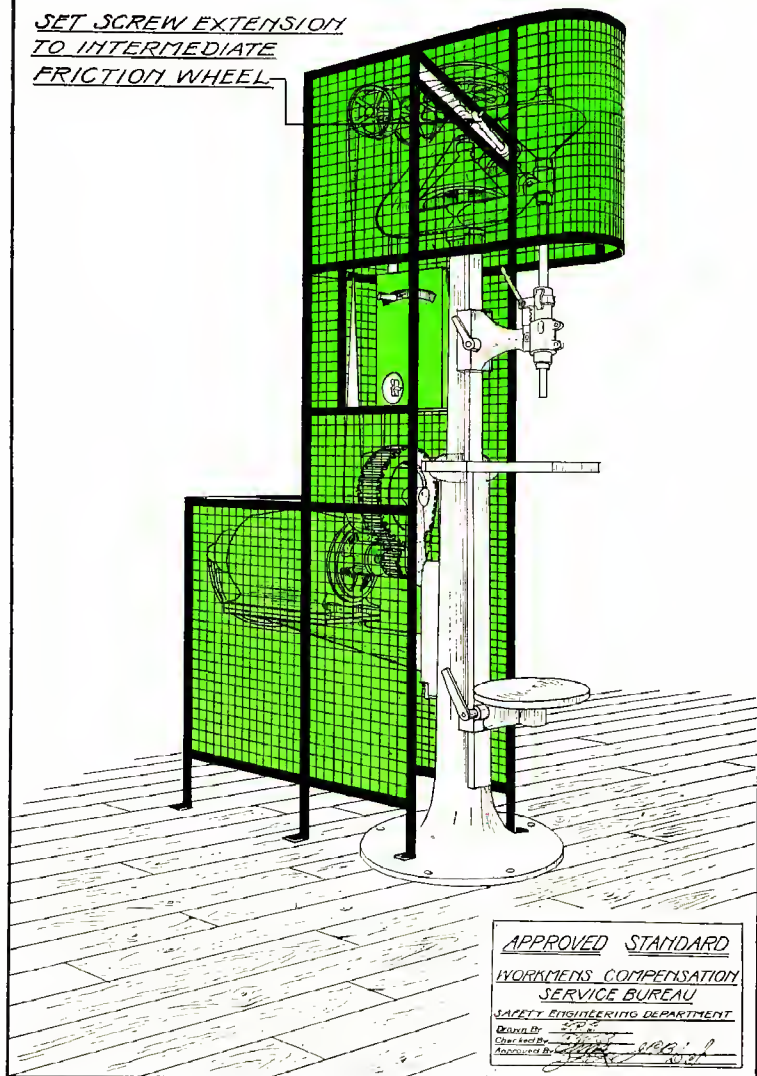
HIGH DUTY DRILL



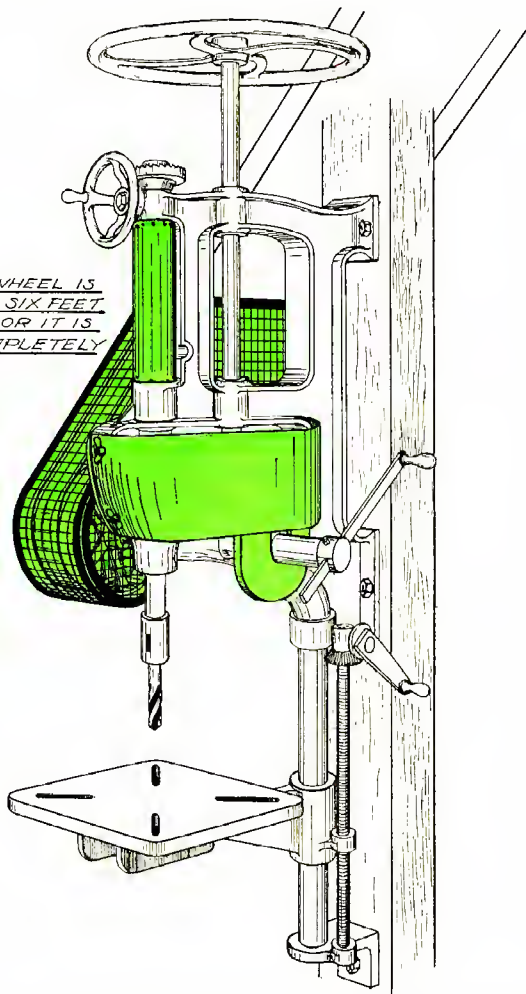
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MOTOR DRIVEN FRICTION DRILL

SET SCREW EXTENSION
TO INTERMEDIATE
FRICTION WHEEL



WHEN FLY WHEEL IS
LESS THAN SIX FEET
ABOVE FLOOR IT IS
TO BE COMPLETELY
GUARDED



UPRIGHT SELF FEEDING
DRILL

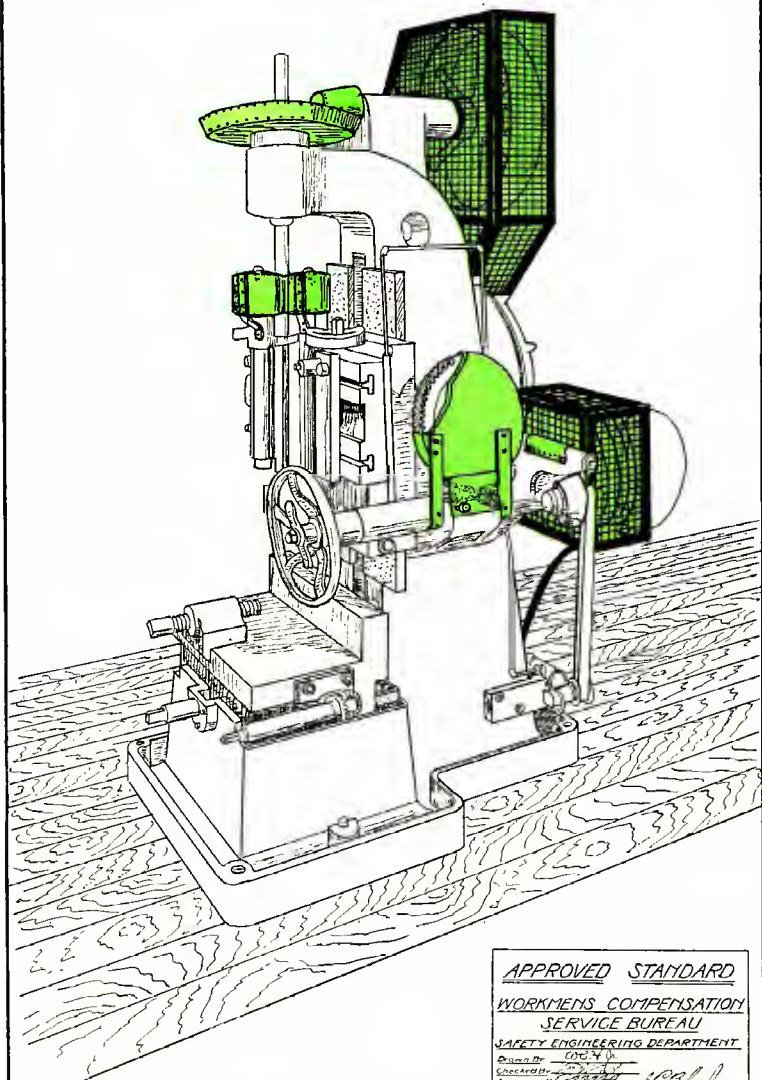
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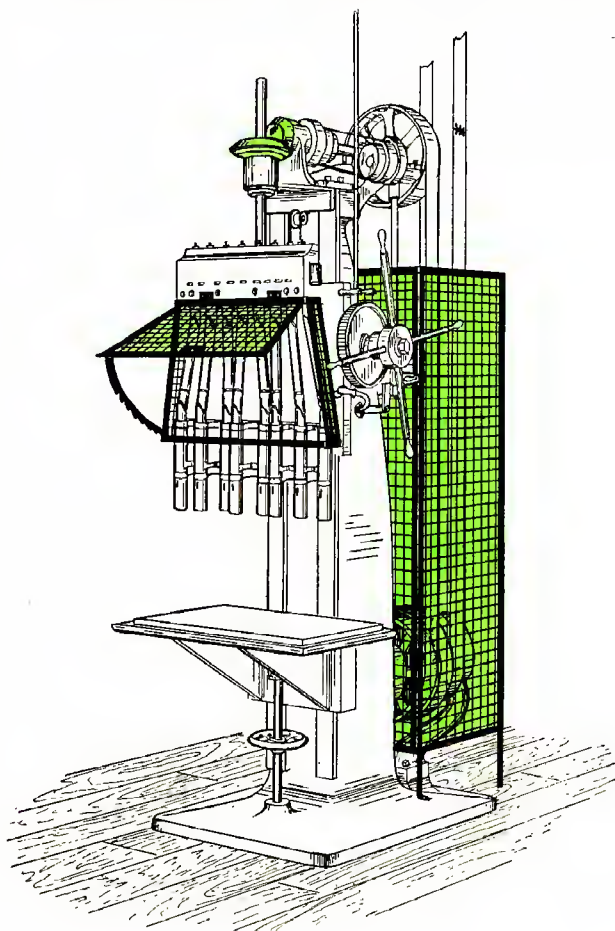
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SPINDLE RAIL DRILLING MACHINE



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UNIVERSAL ADJUSTABLE DRILL



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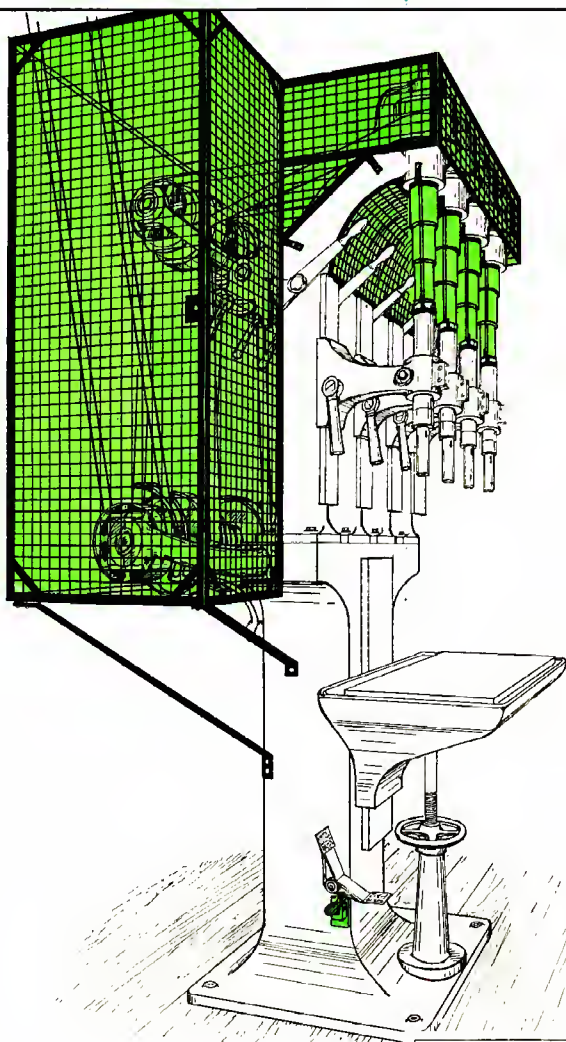
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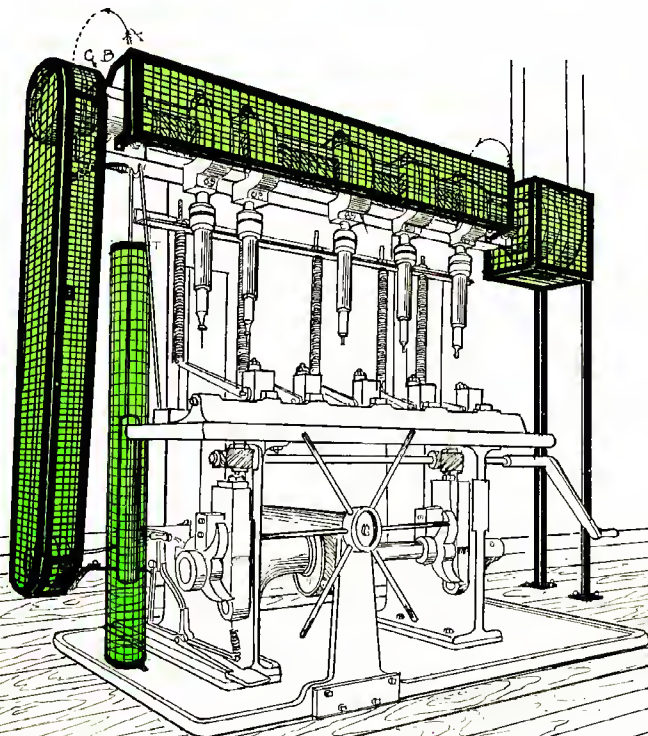
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SENSITIVE DRILLING
MACHINE

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HOLE HOG MULTIPLE DRILL

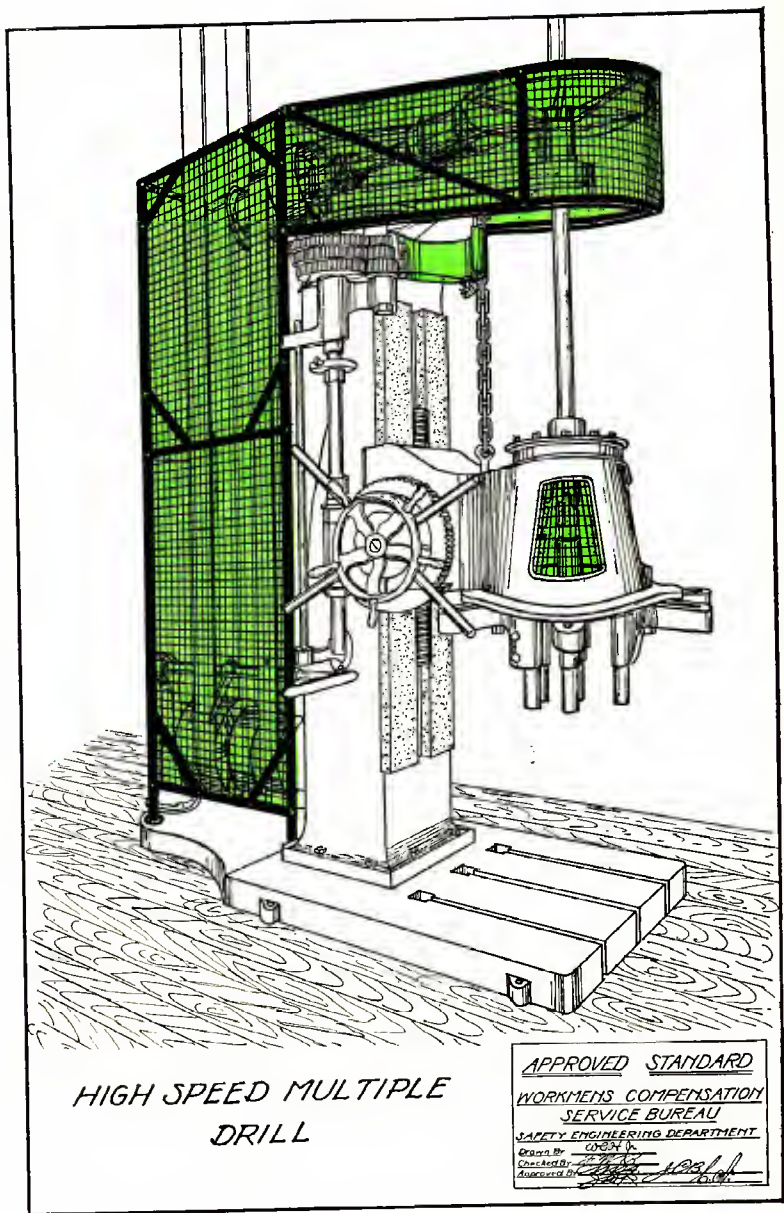


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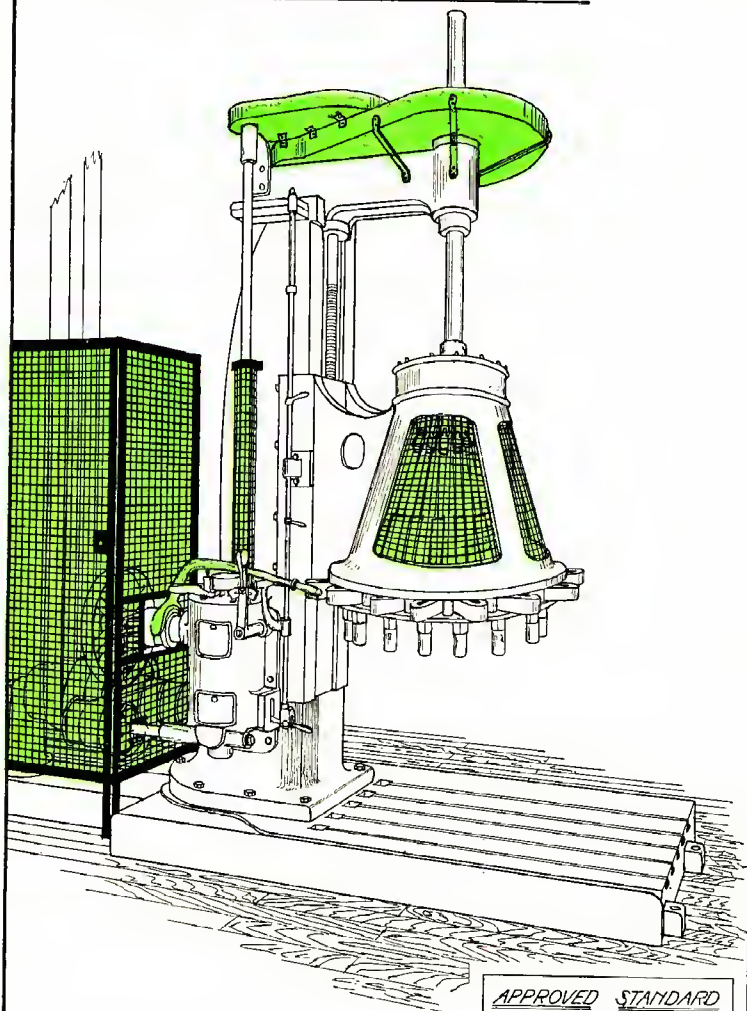
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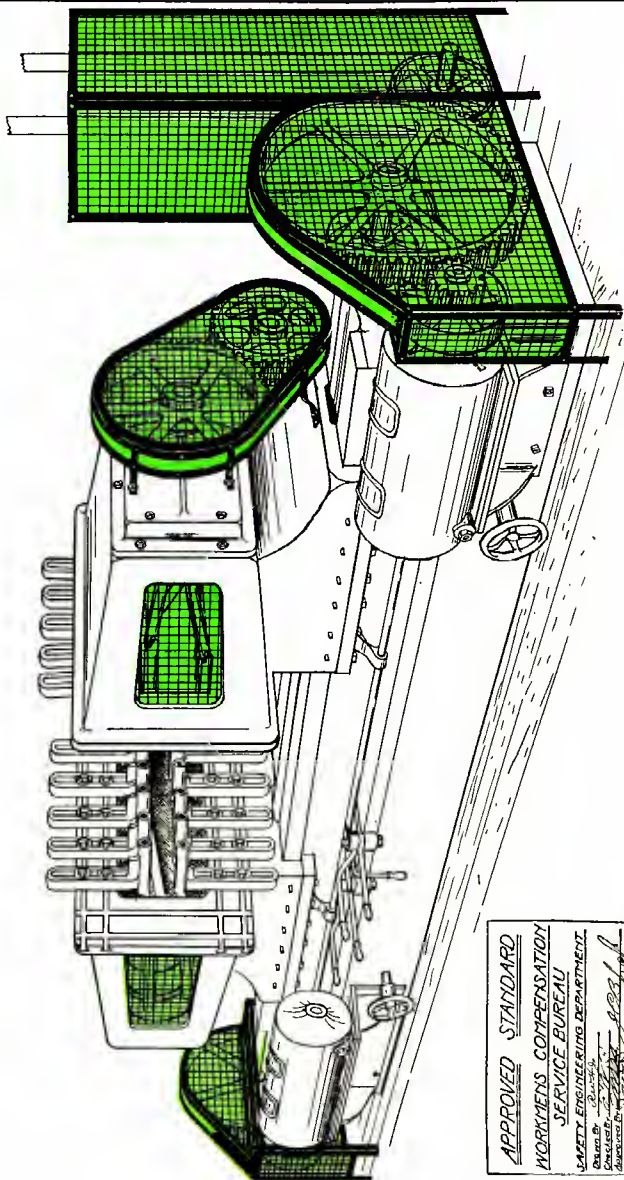
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HIGH SPEED MULTIPLE DRILL



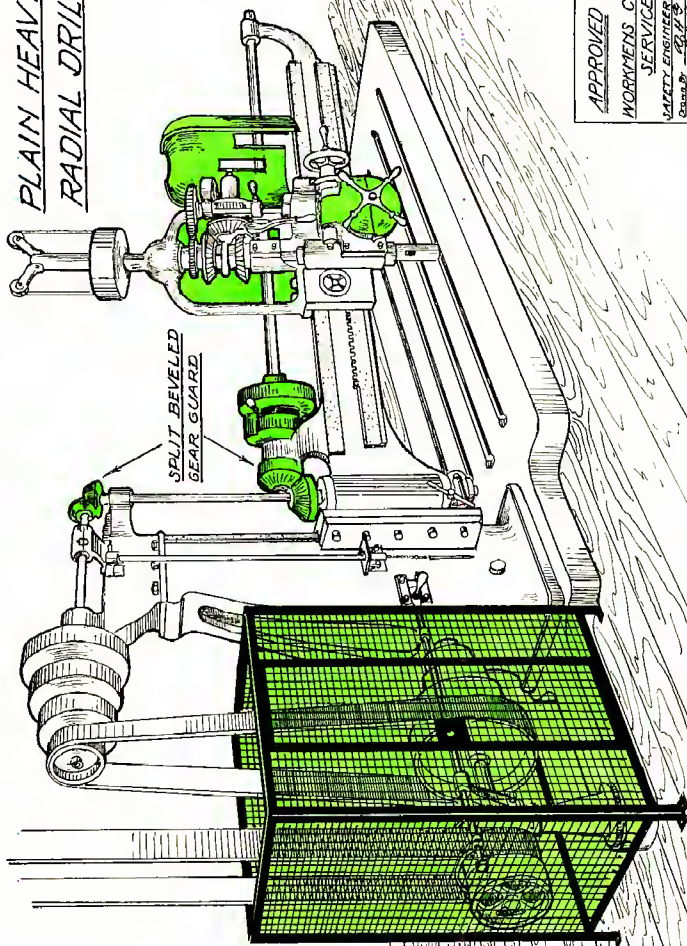
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HORIZONTAL MULTIPLE SPINDLE DRILL



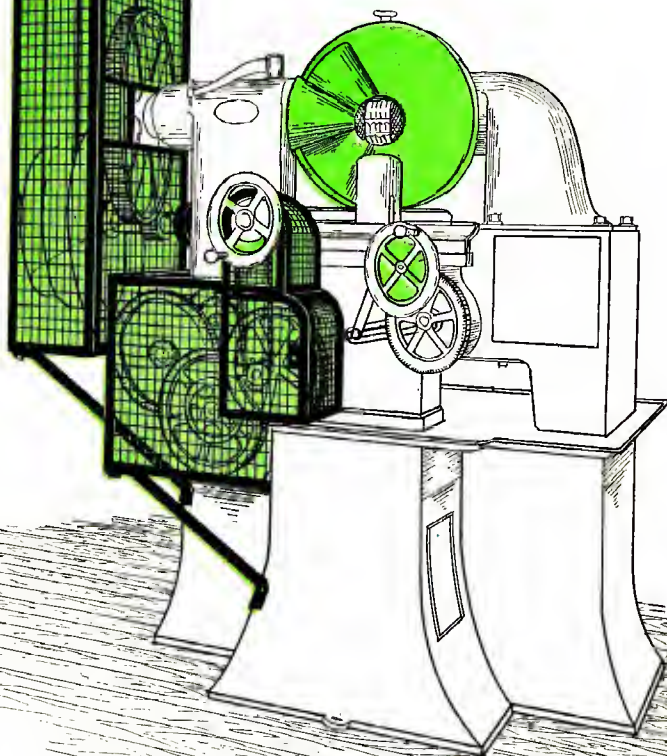
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 1918

PLAIN HEAVY RADIAL DRILL



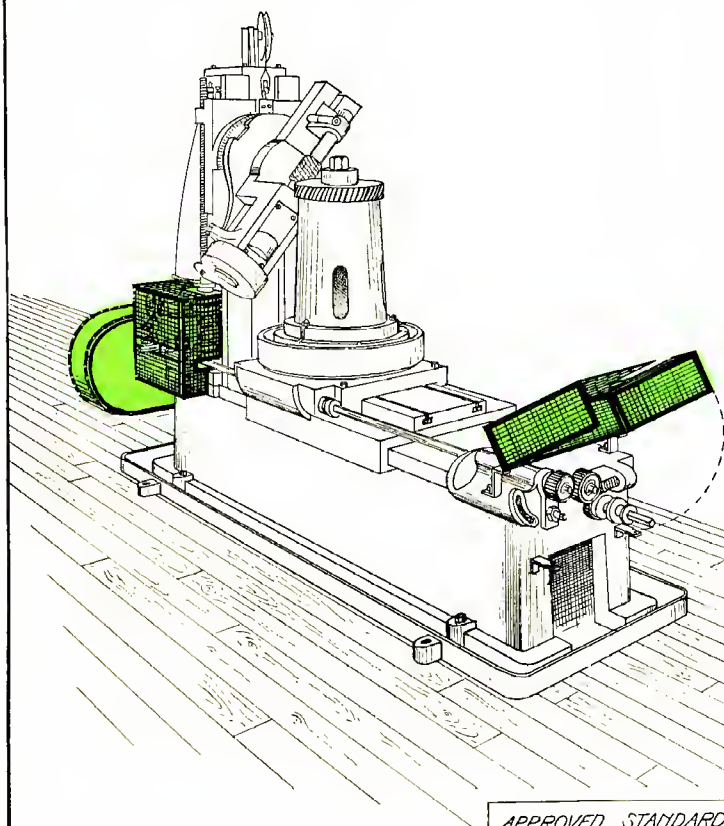
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AUTOMATIC GEAR CUTTING MACHINE

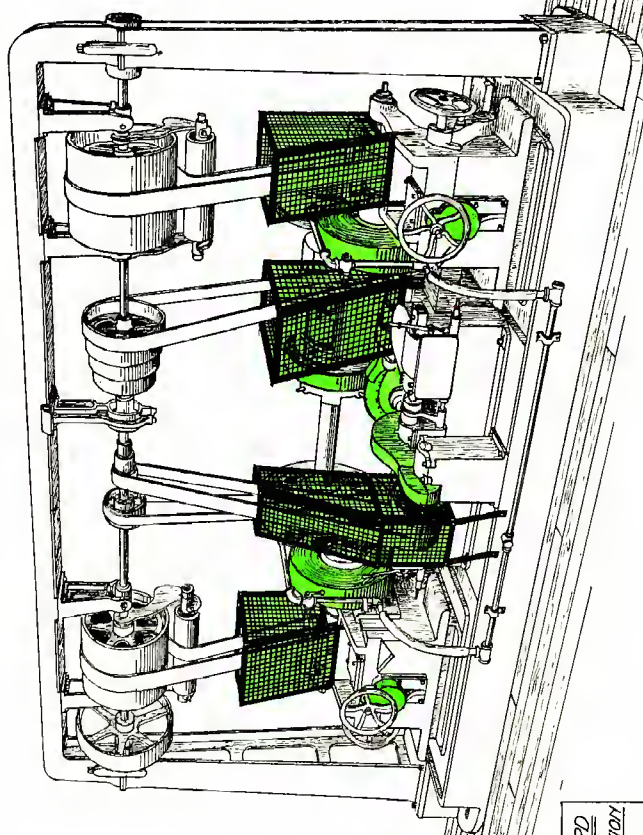


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GEAR GENERATING MACHINE



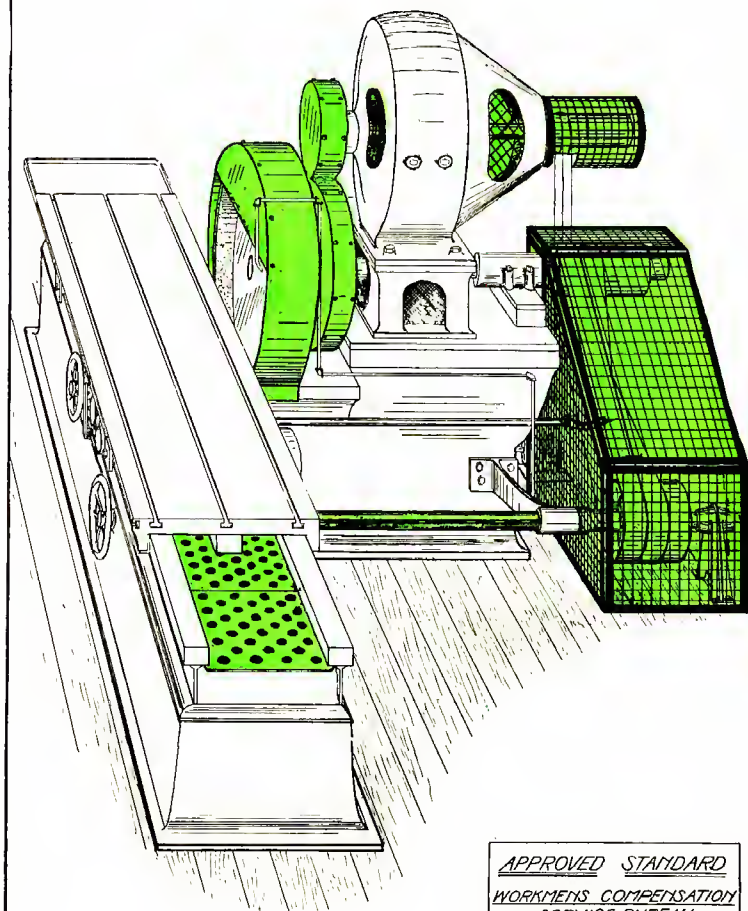
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SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
Drawn By W. J. G.
Checked By W. J. G.
Approved By W. J. G.



CAR WHEEL GRINDER

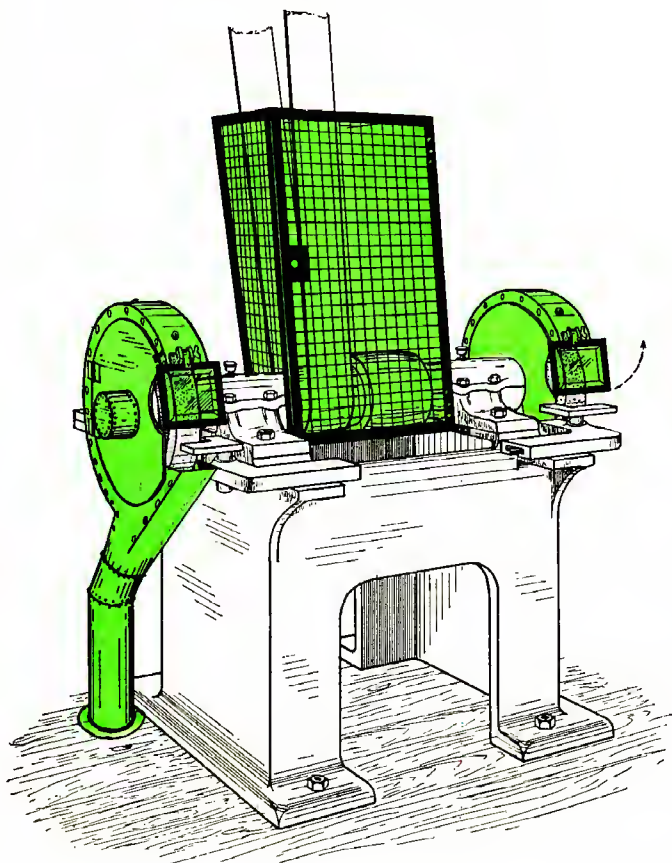
APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
 SAFETY ENGINEERING DEPARTMENT
 Drawn by J.P.S.
 Checked by J.P.S.
 Approved by J.P.S.

GUIDE BAR GRINDER



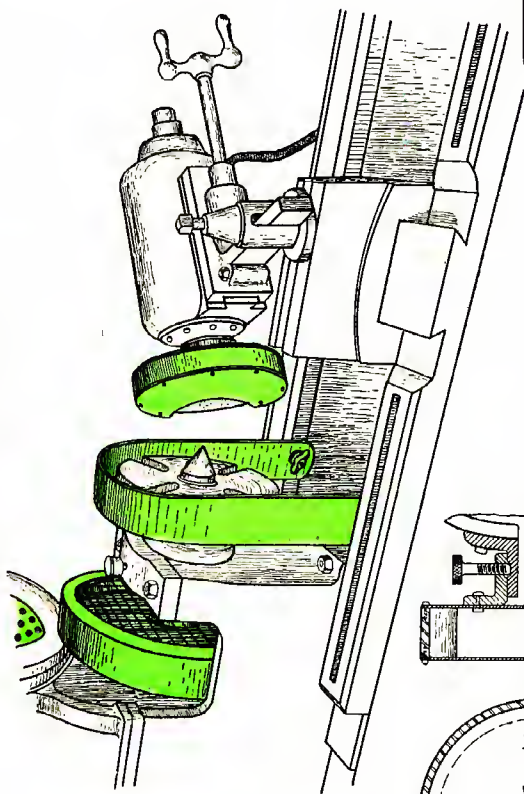
APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
Drawn By: [Signature]
Checked By: [Signature]
Approved By: [Signature]

TOOL GRINDER



APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
 Drawn By: W. H. H. H.
 Checked By: W. H. H. H.
 Approved By: W. H. H. H.

CENTER GRINDER



APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU

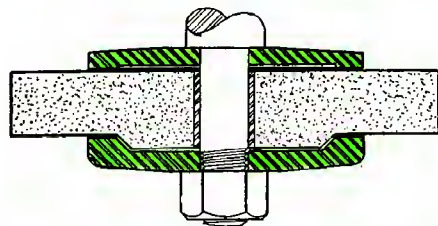
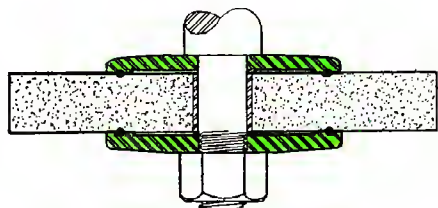
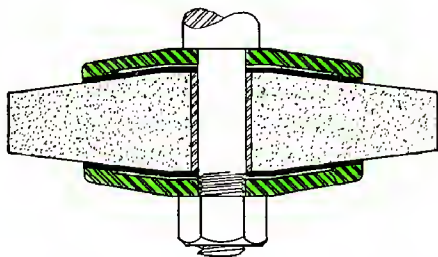
SAFETY ENGINEERING DEPARTMENT

Drawn by R.H.F.

Checked by J.H.F.

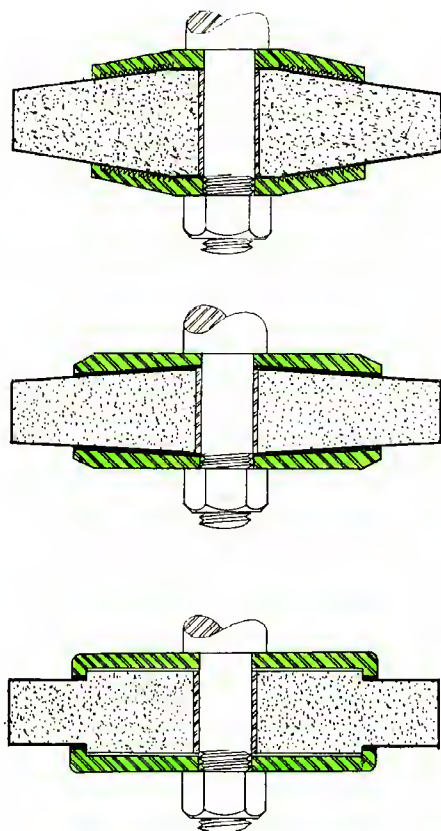
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SAFETY FLANGES FOR GRINDING WHEELS

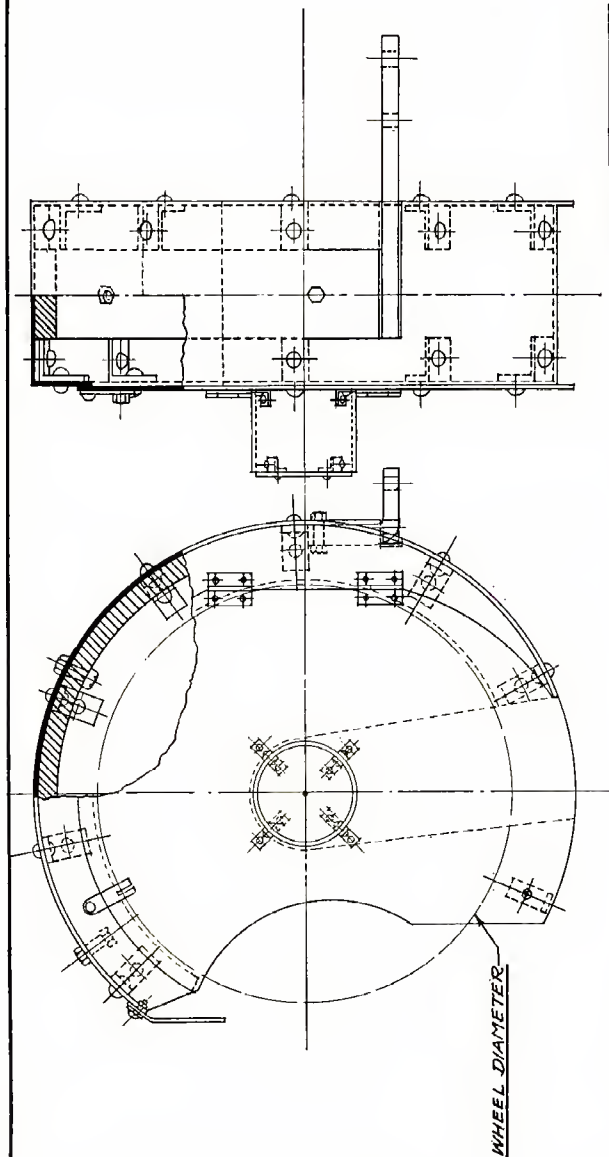


APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
CHICAGO, ILL.
CHECKED BY *[Signature]*
APPROVED BY *[Signature]*

SAFETY FLANGE FOR GRINDING WHEELS



APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
1936
Described by: [Signature]
Approved by: [Signature]

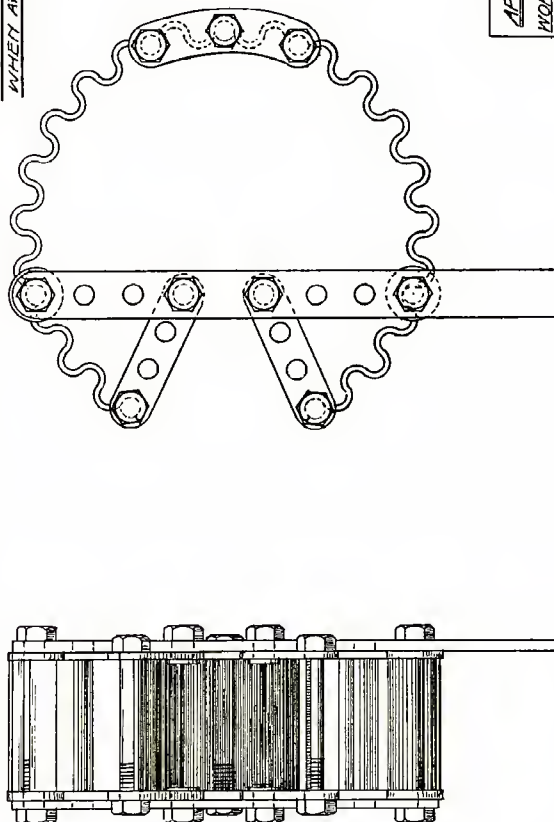


APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
 SAFETY ENGINEERING DEPARTMENT
 Drawn By: W. J. P.
 Checked By: W. J. P.
 Approved By: W. J. P.

GUARD FOR GRINDING WHEEL

BAND GUARD FOR GRINDING WHEELS

TO BE EQUIPPED WITH
SIDE AND ARBOR GUARDS
WHEN APPLIED



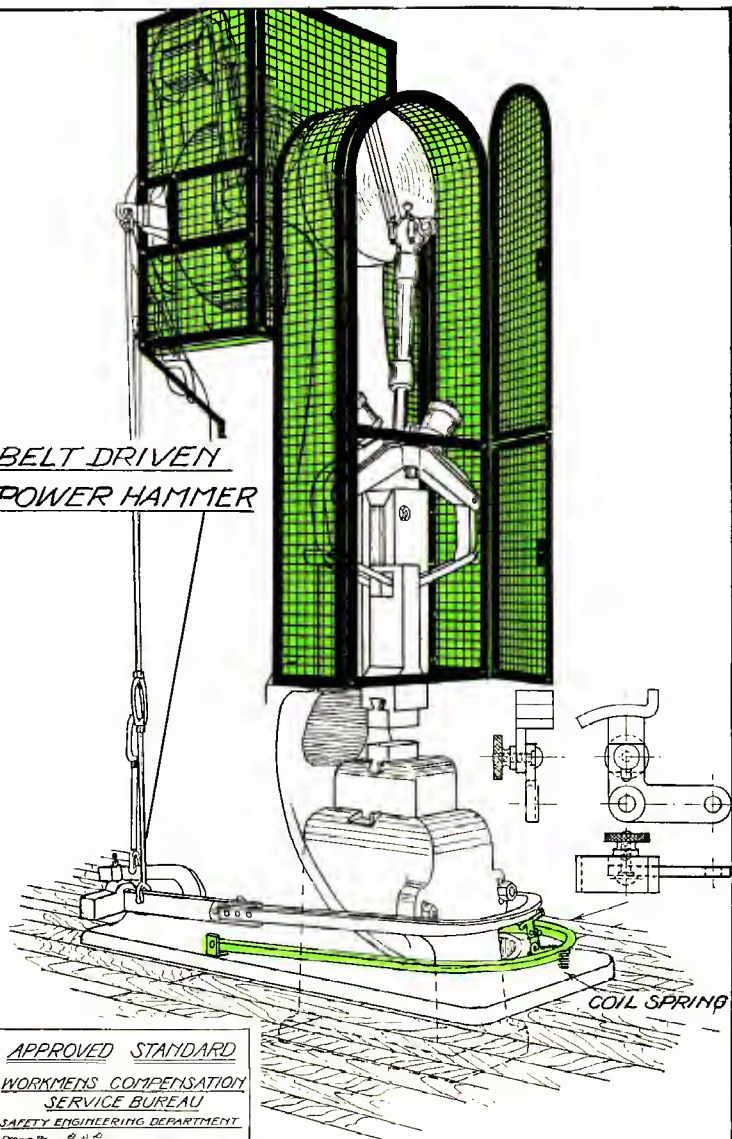
APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
Checked by W. H. H.
Inspected by W. H. H.
Approved by W. H. H.



APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT.
Drawn By: [Signature]
Checked By: [Signature]
Approved By: [Signature]

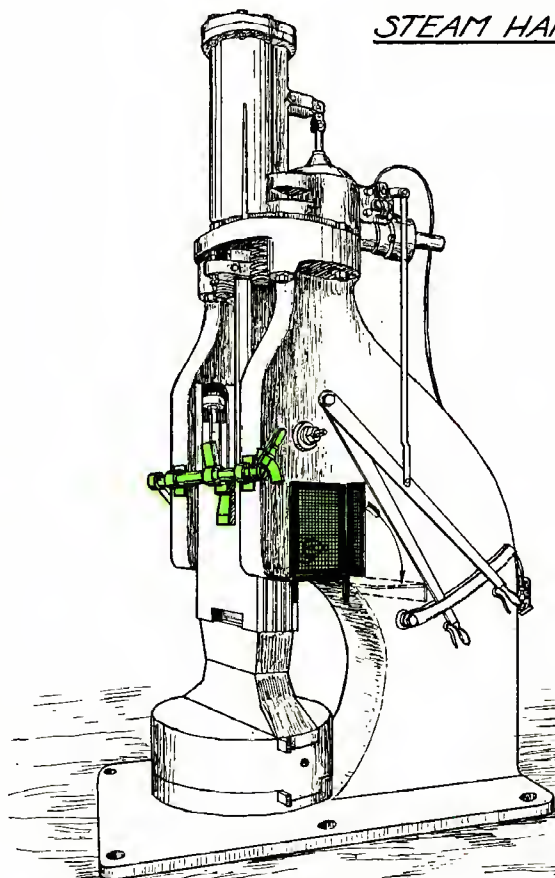
GRINDING WHEEL LIMIT STOPS

BELT DRIVEN
POWER HAMMER



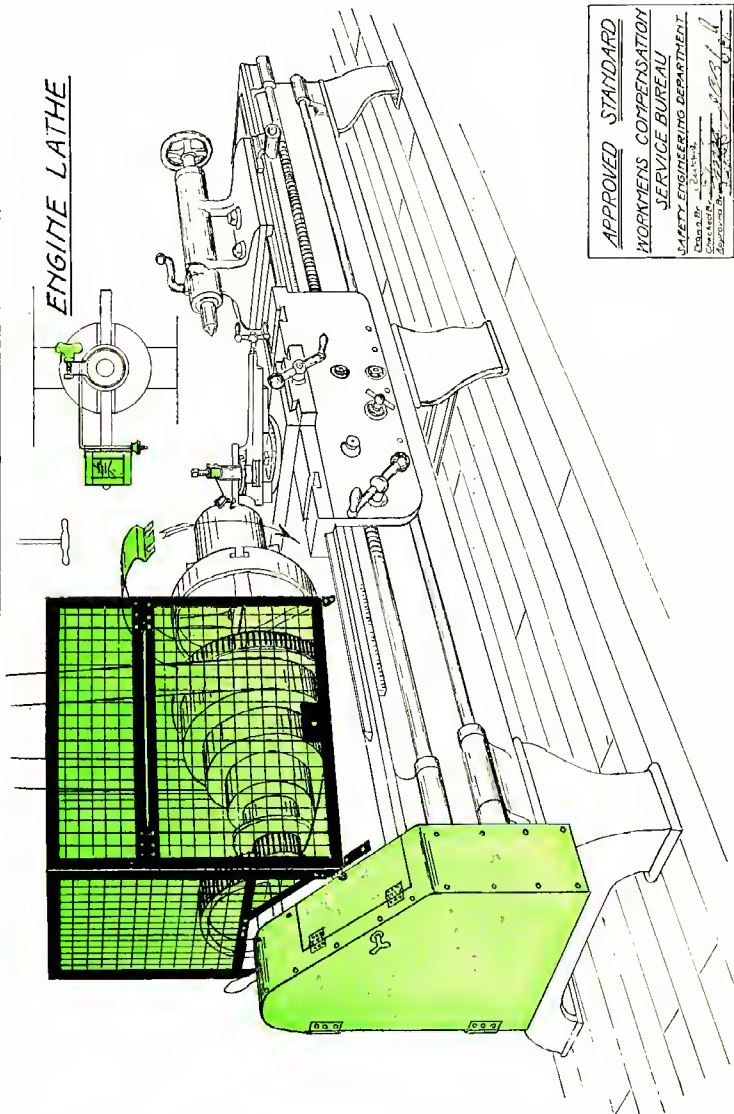
APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
Drawn By W. J. C.
Checked By W. J. C.
Approved By W. J. C.

STEAM HAMMER



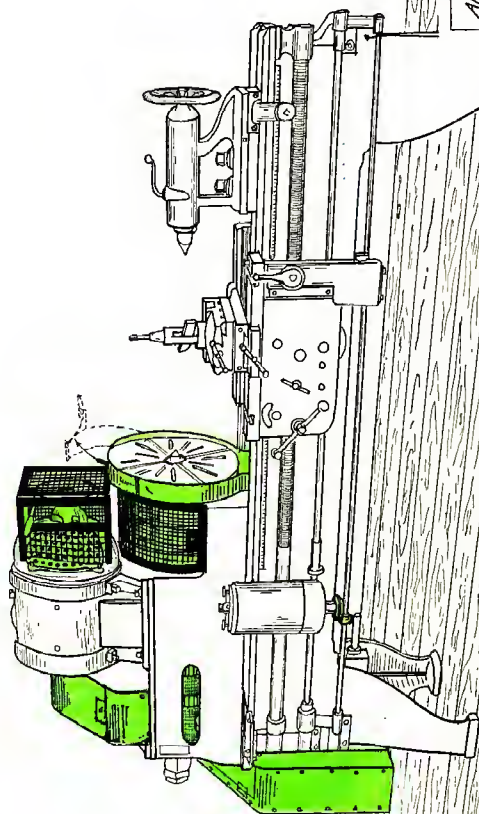
APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
 DESIGNED BY W. H. H.
 CHECKED BY [Signature]
 APPROVED BY [Signature]

ENGINE LATHE



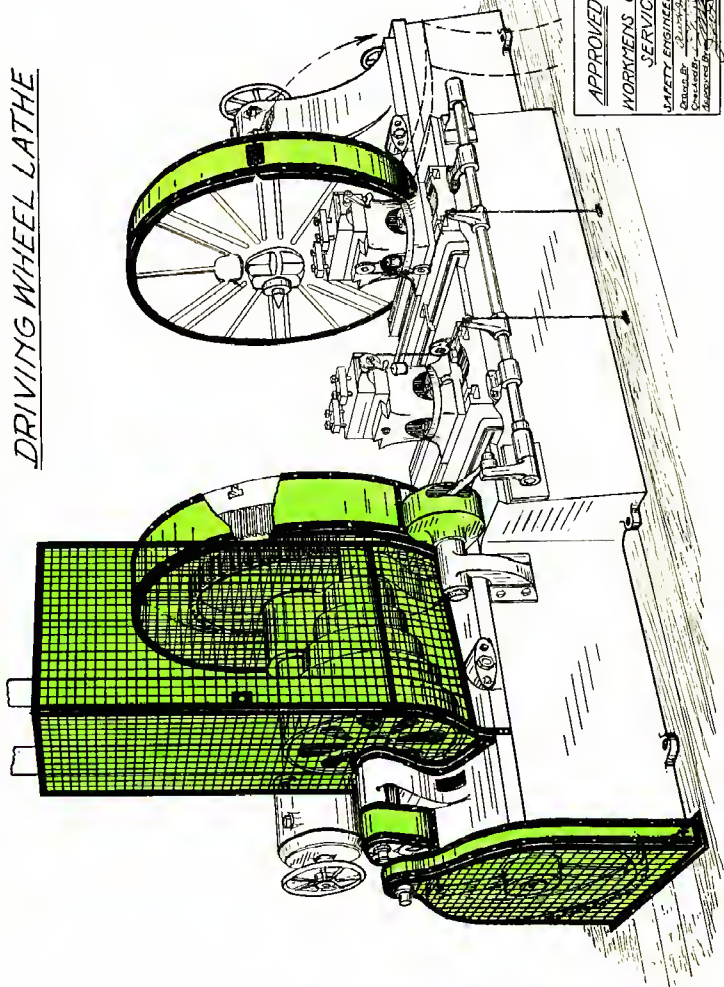
APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
CHICAGO, ILL.
APPROVED BY: [Signature]

ENGINE LATHE MOTOR DRIVEN



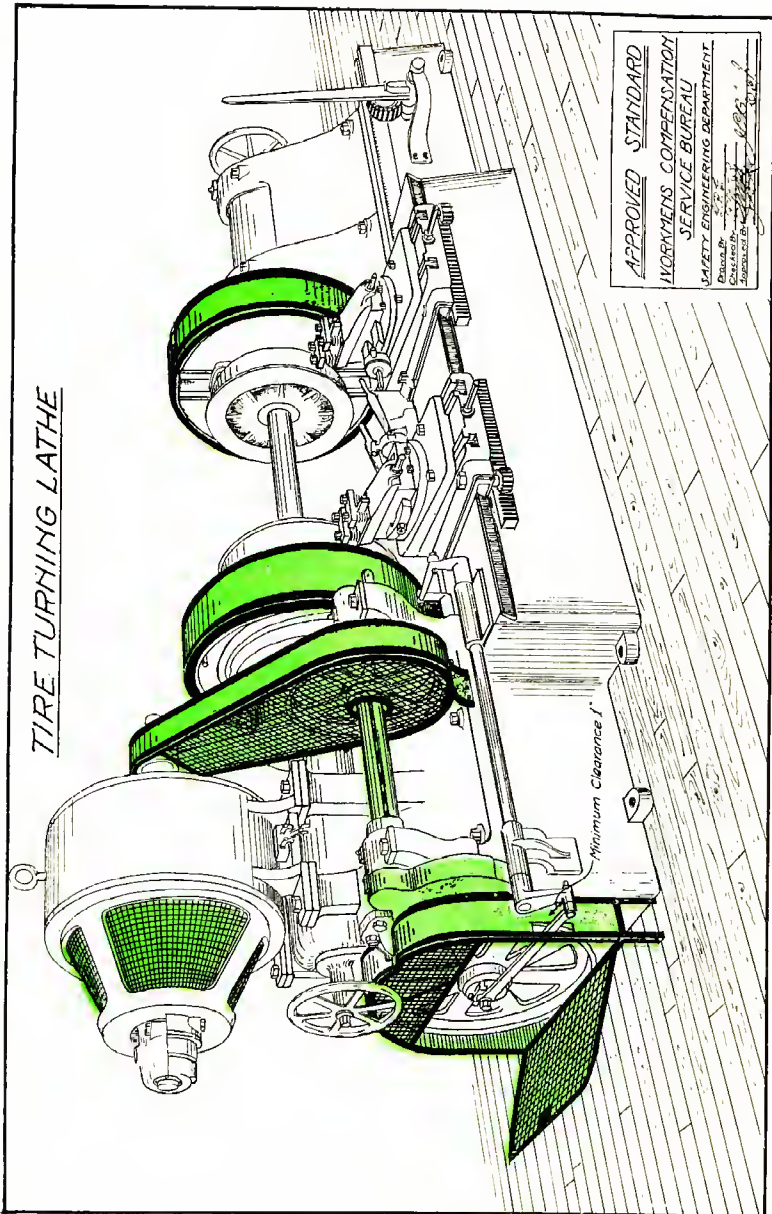
APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
 SAFETY ENGINEERING DEPARTMENT
 1110
 CHICAGO, ILL.
 APPROVED BY: *[Signature]*

DRIVING WHEEL LATHE



APPROVED STANDARD
 WORKMENS COMPENSATION
 SERVICE BUREAU
 SAFETY ENGINEERING DEPARTMENT
 CHICAGO, ILL.
 APPROVED BY W. H. H. H.
 DATE 10/25/19

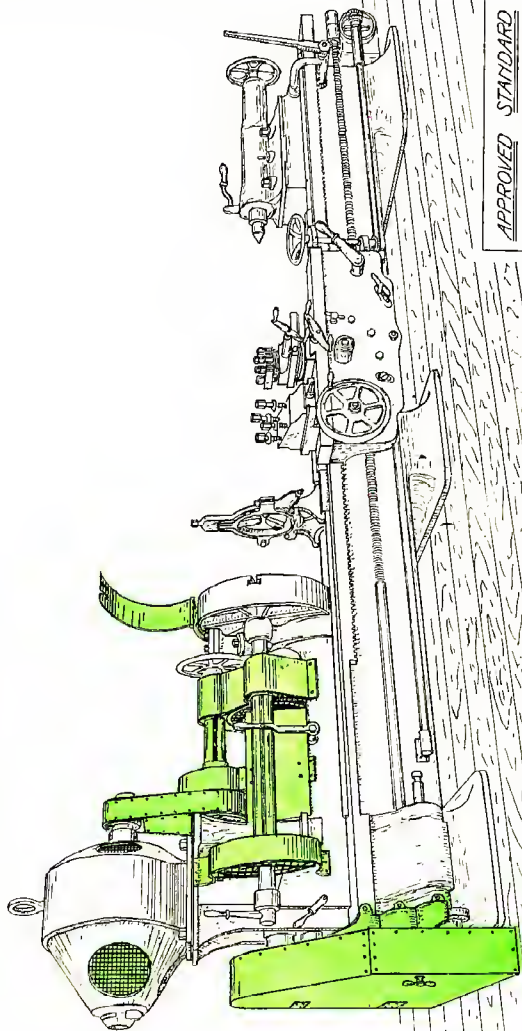
TIRE TURNING LATHE



APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT

Drawn By: W. E. H.
 Checked By: W. E. H.
 Approved By: W. E. H.

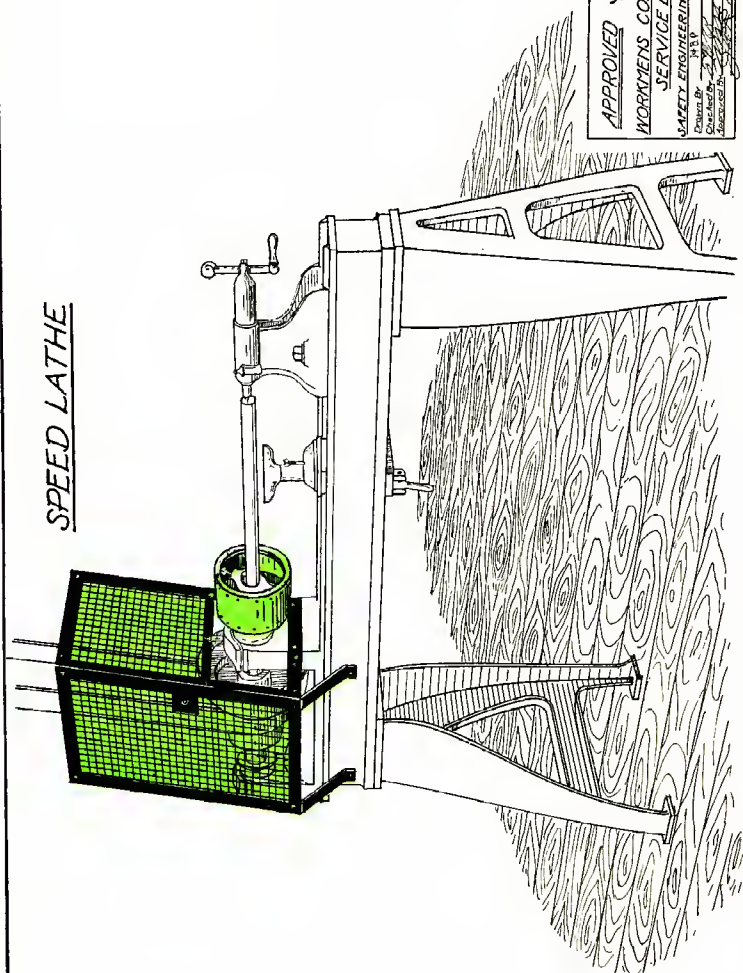
HEAVY BACK GEARED LATHE



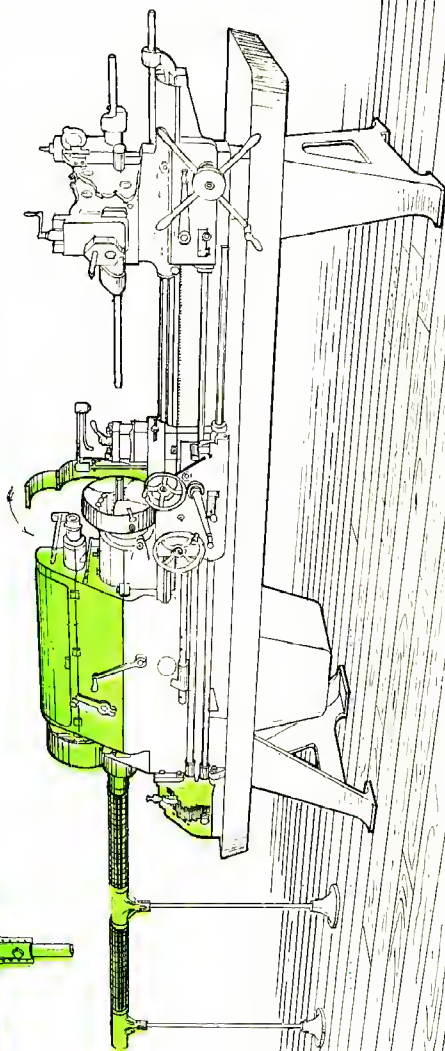
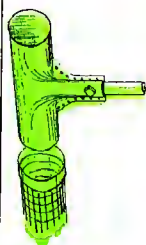
APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
DESIGNED BY - O. H. W.
CHECKED BY - [Signature]
APPROVED BY - [Signature]

SPEED LATHE

APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
 SAFETY ENGINEERING DEPARTMENT
 FORM NO. 3-19
 Checked by: [Signature]
 Approved by: [Signature]



DETAIL OF STOCK GUARD APPLIED
TO ORDINARY STANDARD



APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU

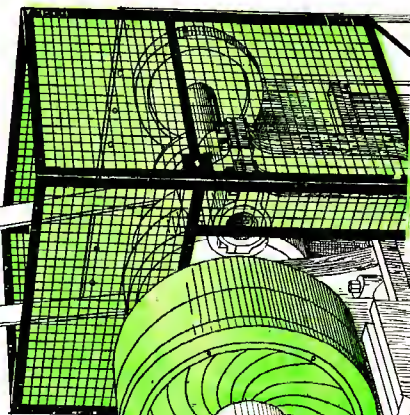
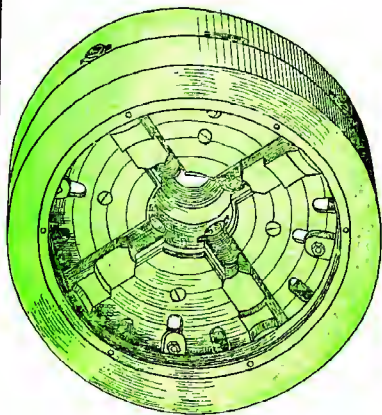
SAFETY ENGINEERING DEPARTMENT

Checked By 5-7-2

Approved By W. E. B.

UNIVERSAL HOLLOW HEXAGON TURRET LATHE

SAFETY CHUCK PATENTED



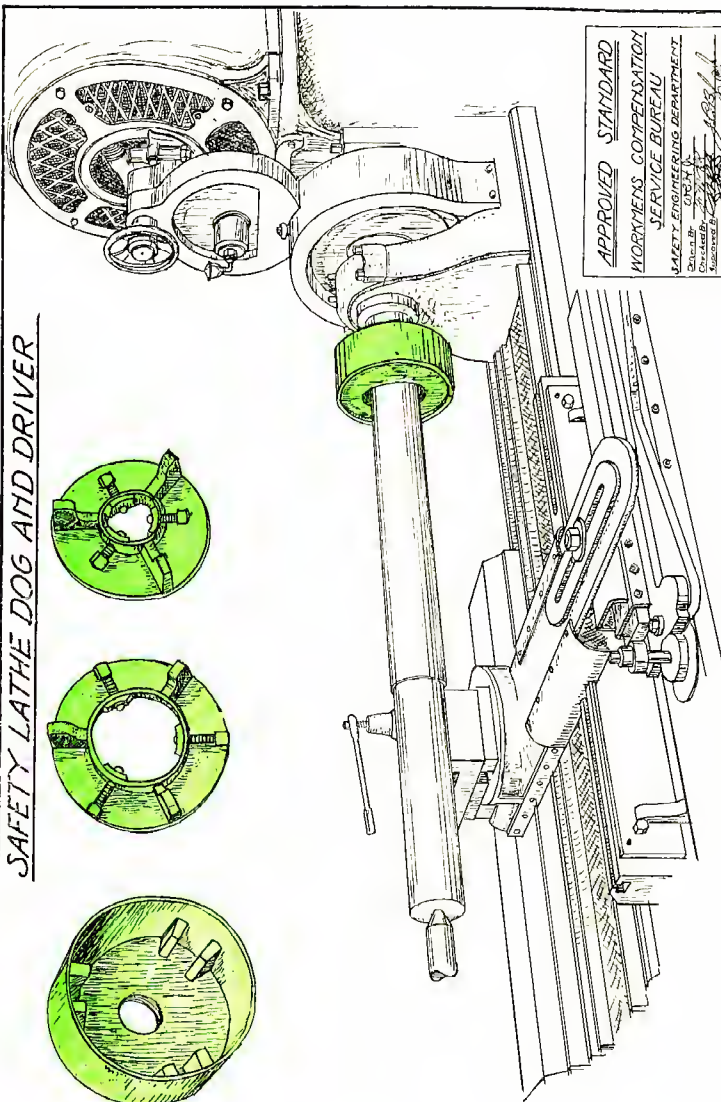
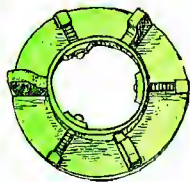
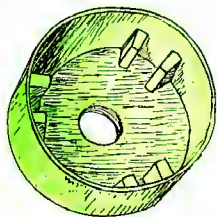
APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT

Drawn by W. H. H.

Checked by W. H. H.

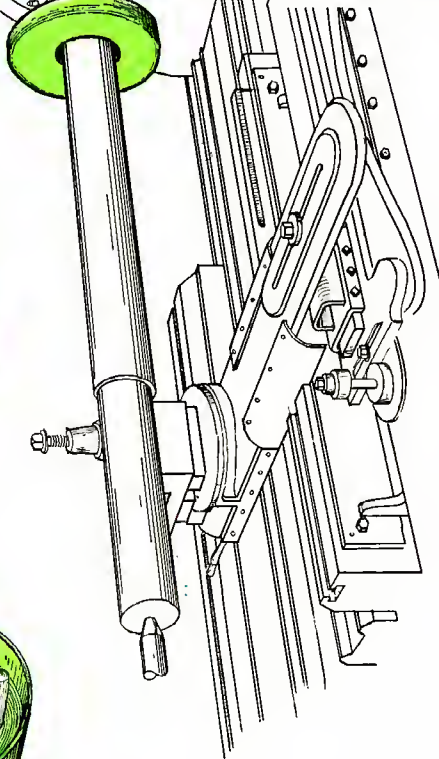
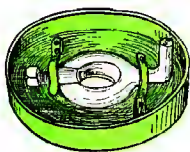
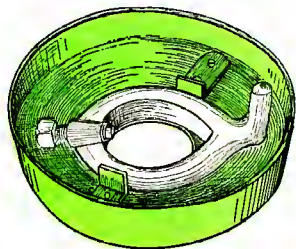
Approved by W. H. H.

SAFETY LATHE DOG AND DRIVER



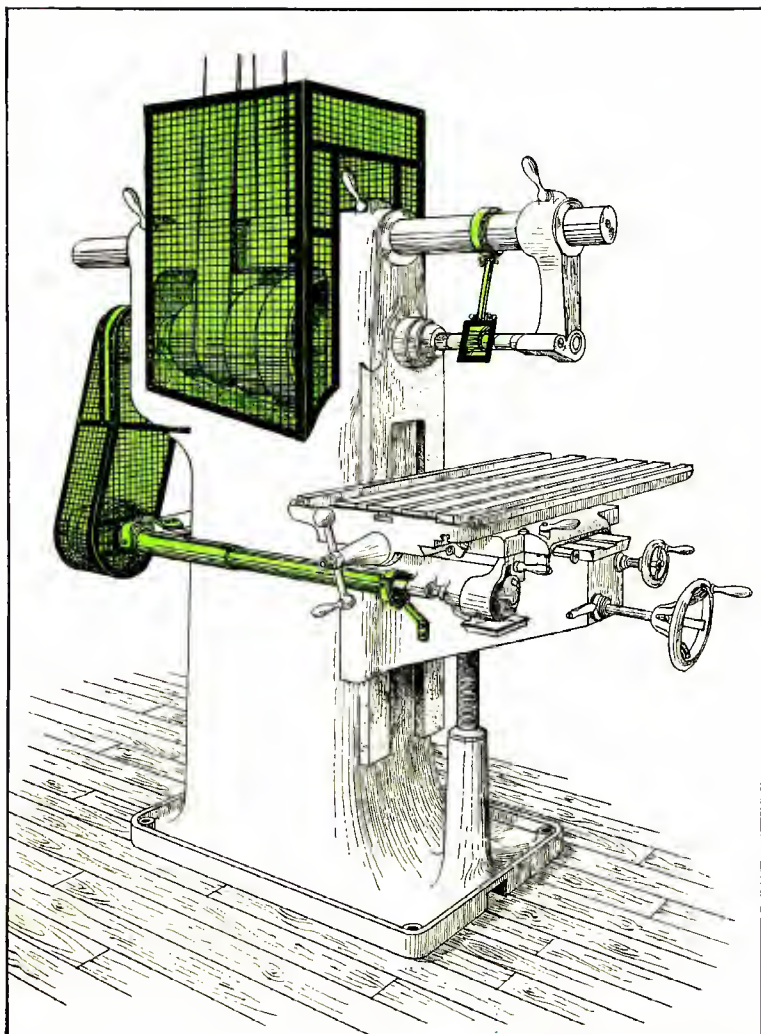
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WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
CHICAGO, ILL.
JAN 1917
RECEIVED BY *[Signature]* 1-23-17

LATHE DOG GUARD



APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU

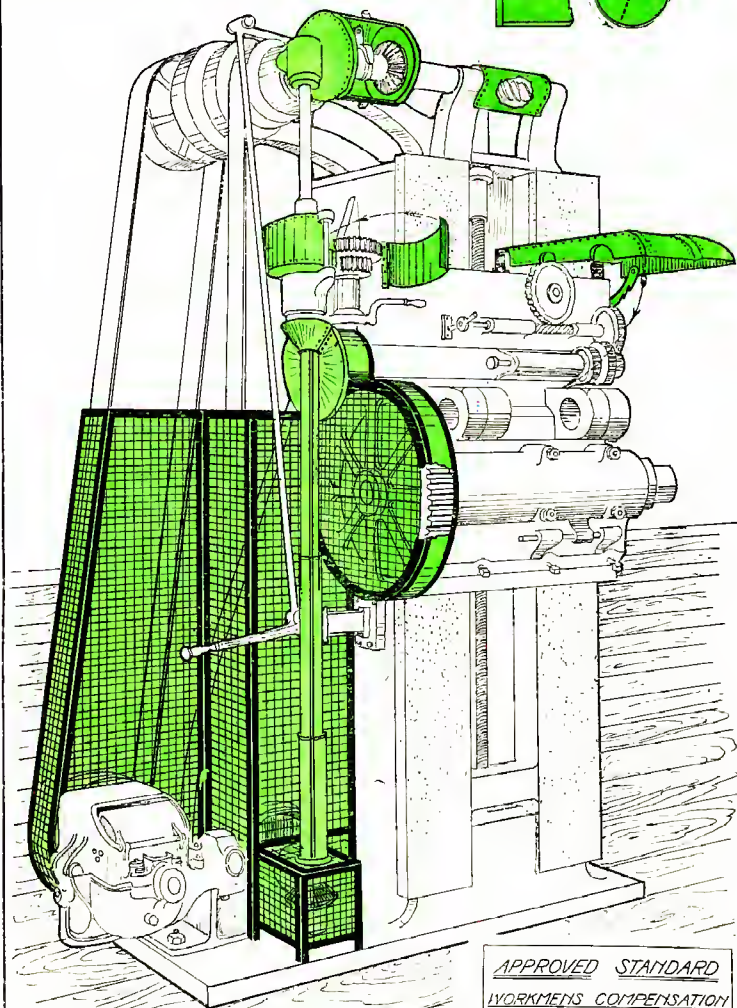
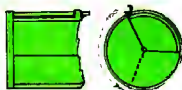
SAFETY ENGINEERING DEPARTMENT
P. O. BOX 100
NEW YORK, N. Y.
JAN 10 1934



PLAIN MILLING MACHINE

APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
 Drawn By W. J. H.
 Checked By W. J. H.
 Approved By W. J. H.

PORTABLE MILLING MACHINE



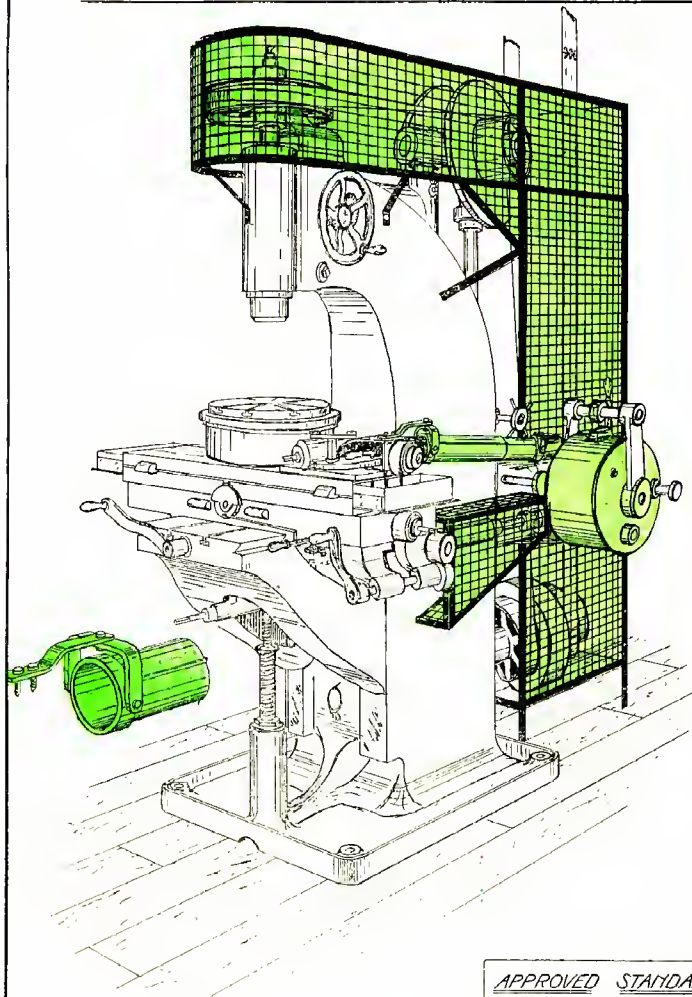
APPROVED STANDARD

WORKMENS COMPENSATION
SERVICE BUREAU

SAFETY ENGINEERING DEPARTMENT

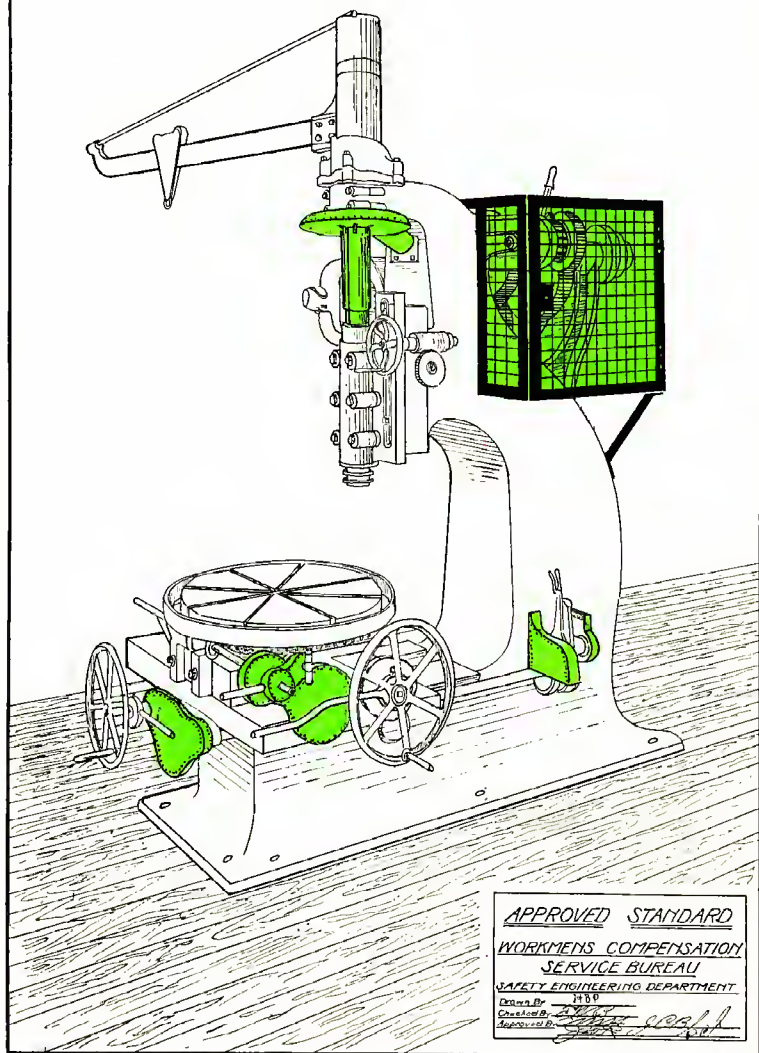
MADE BY W. H. W.
CHECKED BY W. H. W.
APPROVED BY W. H. W.

BELTED VERTICAL MILLING MACHINE



APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
 Checked By W. H. H. H.
 Checked By W. H. H. H.
 Approved By W. H. H. H. W. H. H. H.

HEAVY VERTICAL MILLING MACHINE



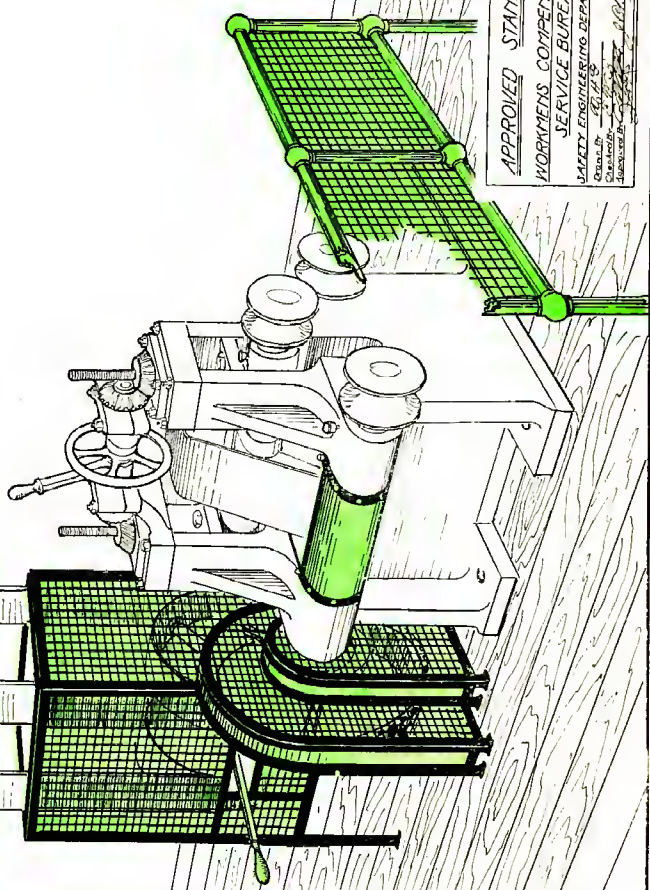
PIPE MACHINE

CHUCK AND BACK
GEAR MUST BE
COMPLETELY
GUARDED BY
BAND GUARDS

APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT

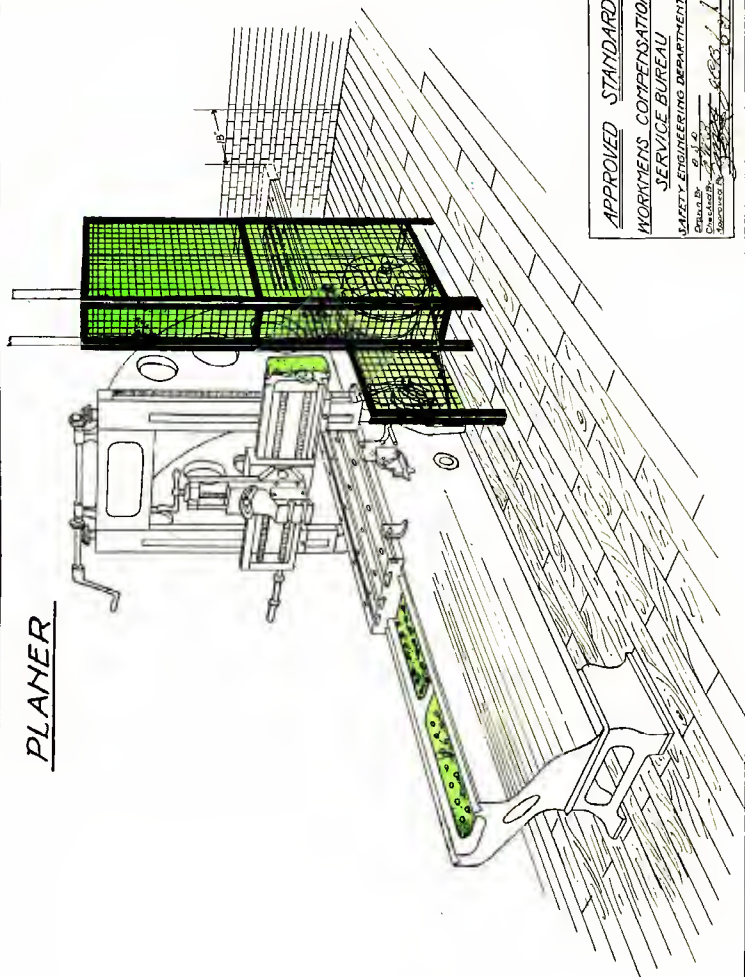
Drawn By W. H. H. H.
Checked By W. H. H. H.
Reviewed By W. H. H. H.

POWER PIPE BENDING MACHINE



APPROVED STANDARD
WORKMENS COMPENSATION
SE SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
 Drawn by E. J. H. S.
 Checked by J. H. S.
 Approved by J. H. S.
 Date 1/1/1917

PLANER



APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU

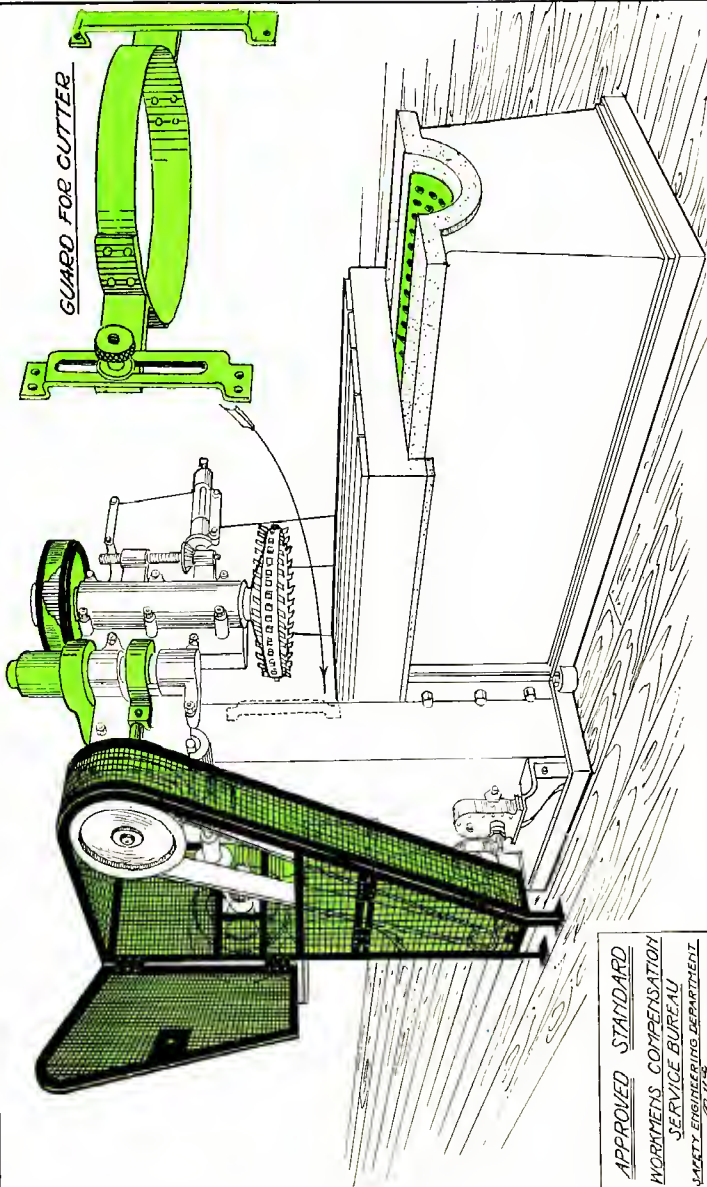
SAFETY ENGINEERING DEPARTMENT

Drawn By G. H. G.

Checked By G. H. G.

Approved By G. H. G.

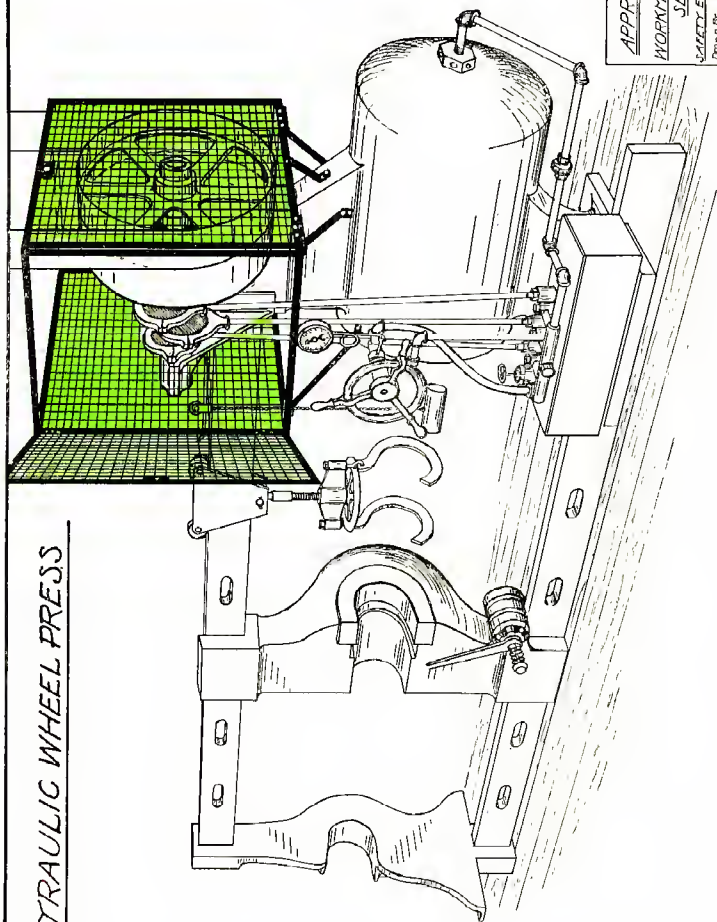
VERTICAL SPINDLE ROTARY PLANING MACHINE



GUARD FOR CUTTER

APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
Safety Engineering Department
 Exam'd By W. H. H. H.
 Examined By W. H. H. H.
 Date 10/23/1913

HYDRAULIC WHEEL PRESS

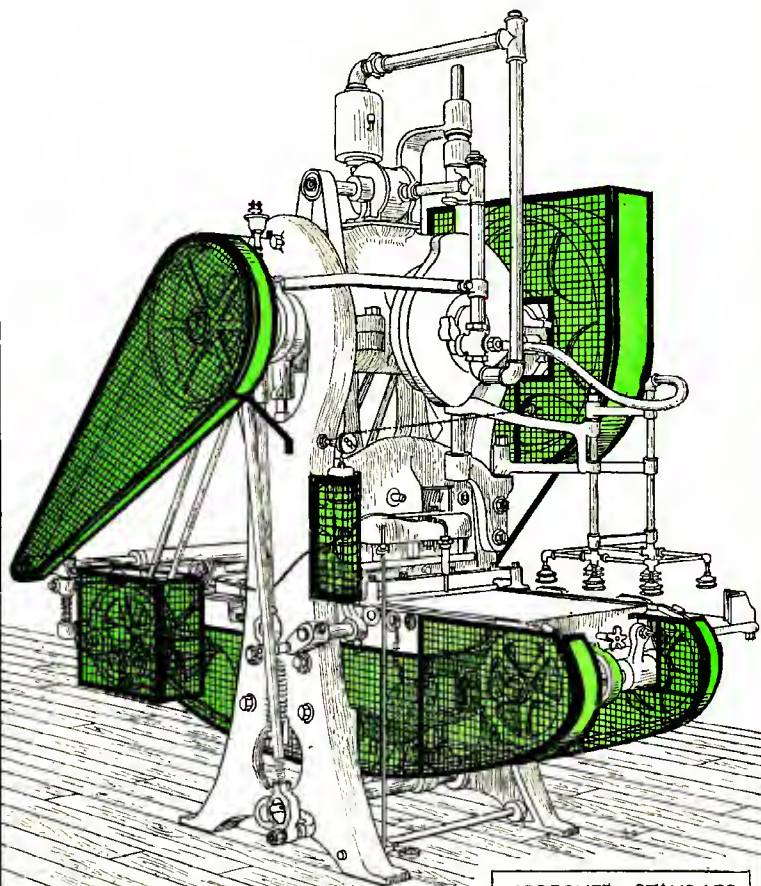


APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT

Drawn By: J. C. Smith
 Checked By: J. C. Smith
 Approved By: J. C. Smith
 Date: 10/1/1918

STOPPER PRESS

AUTOMATIC FEED



APPROVED STANDARD

WORKMENS COMPENSATION
SERVICE BUREAU

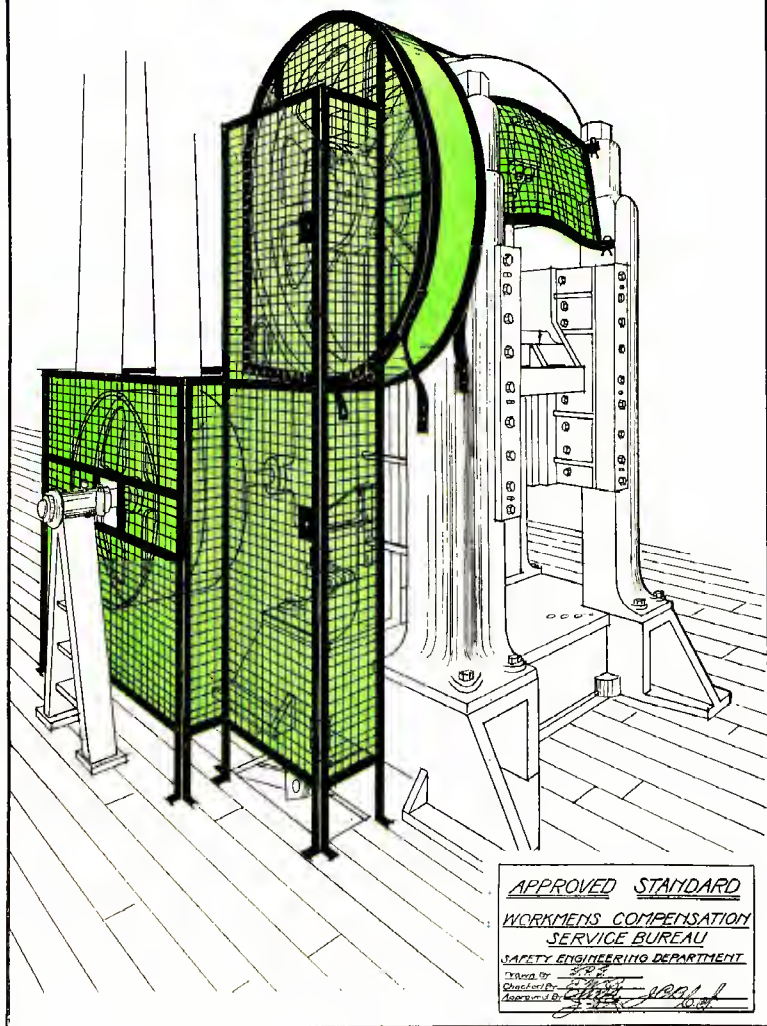
SAFETY ENGINEERING DEPARTMENT

Exam'd By W. H. H.

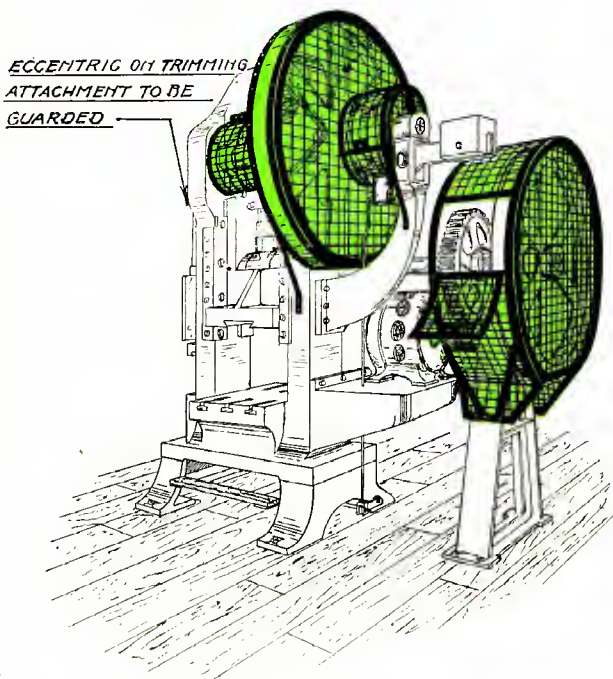
Classified By W. H. H.

Approved By W. H. H.

STRAIGHT SIDED PRESS DOUBLE-GEARED

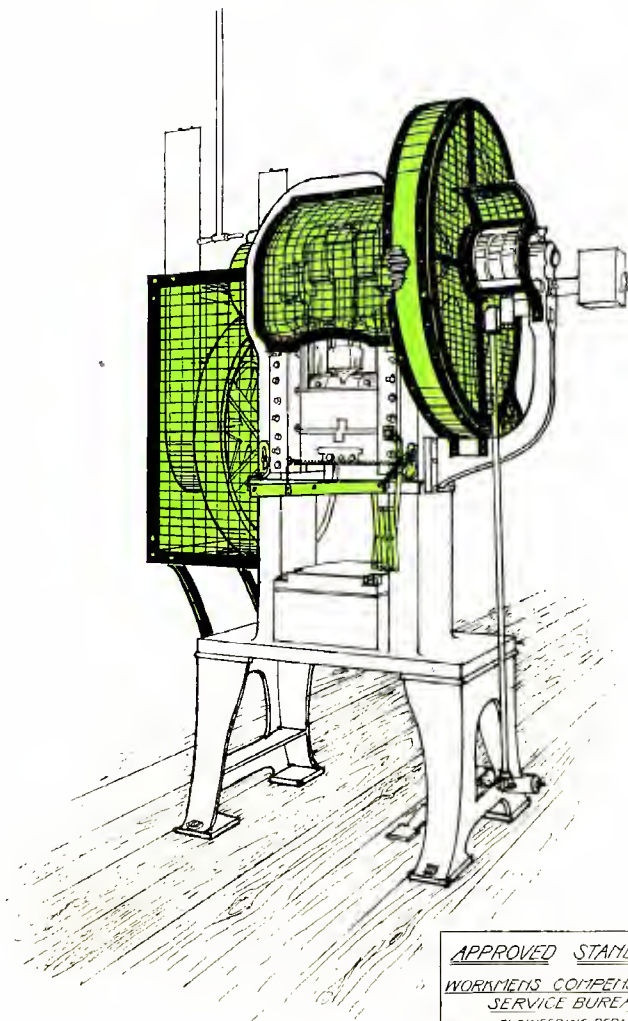


STRAIGHT SIDED TRIMMING PRESS



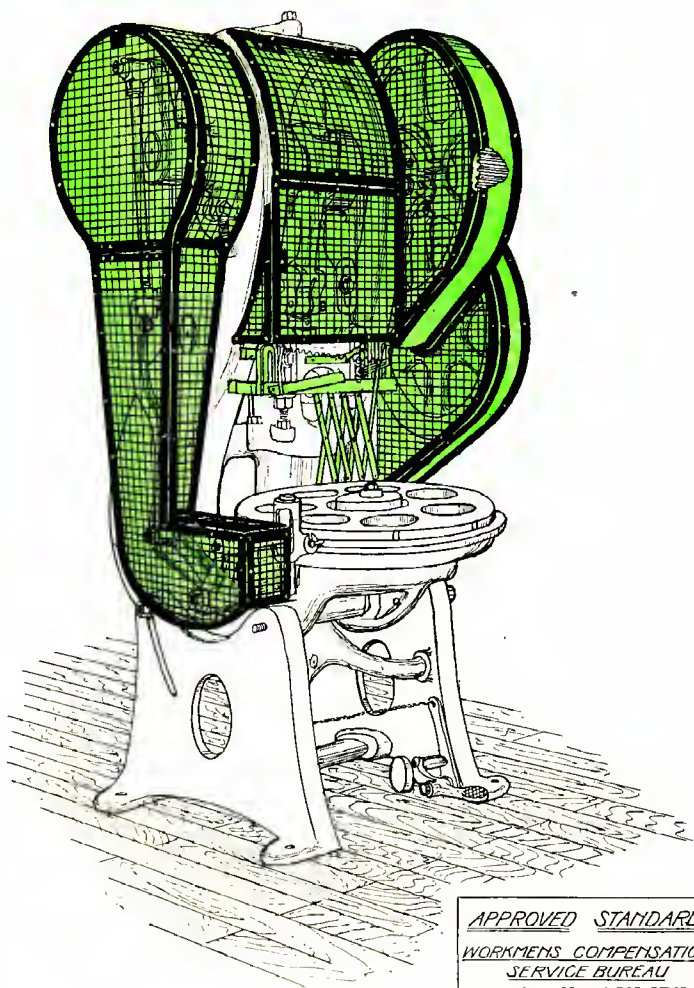
APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
 Design By W. H. H. H.
 Checked By W. H. H. H.
 Approved By W. H. H. H. 1006/1

STRAIGHT SIDED STAMPING PRESS



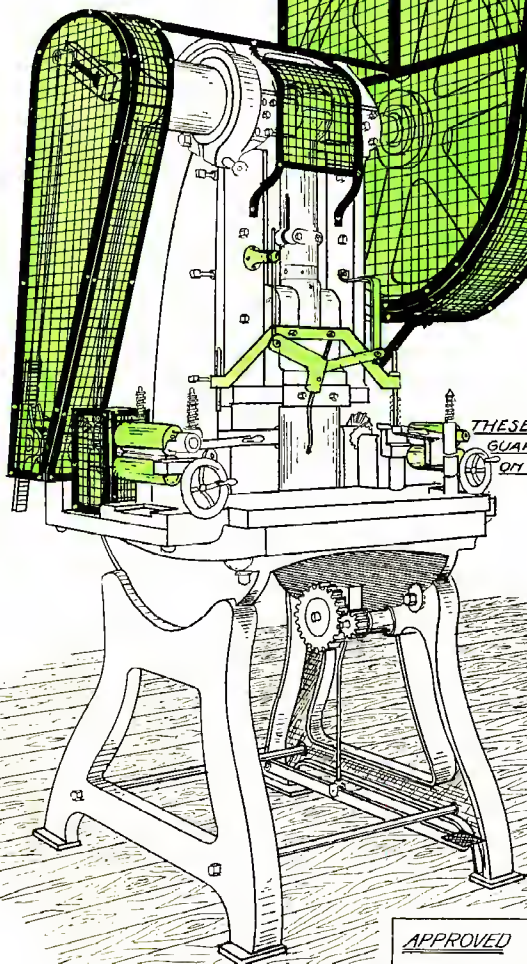
APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
 Drawn By C. A. J.
 Checked By C. A. J.
 Approved By W. H. J.

DIAL FEED PRESS



APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
 DESIGNED BY E. J. O.
 CHECKED BY E. J. O.
 APPROVED BY E. J. O.

INCLINABLE POWER PRESS



THESE ROLLS TO BE
GUARDED AS SHOWN
ON OTHER SET

APPROVED STANDARD

WORKMENS COMPENSATION
SERVICE BUREAU

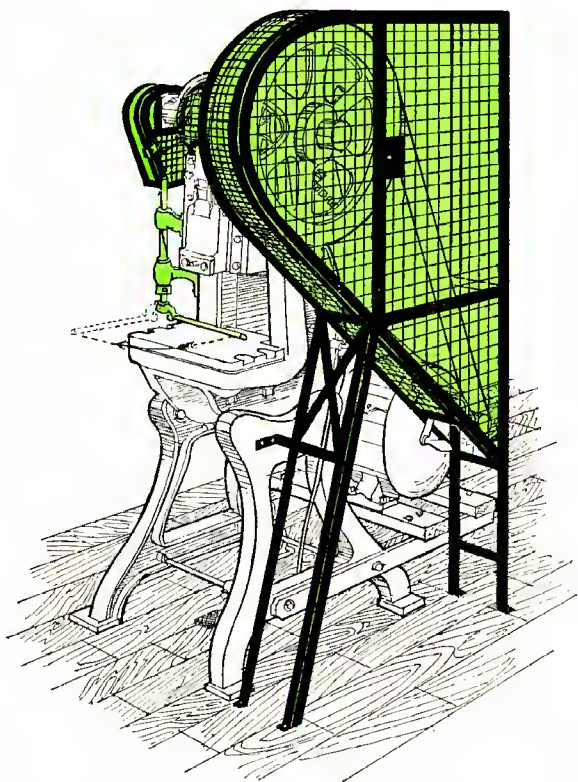
SAFETY ENGINEERING DEPARTMENT

Drawn By HBP

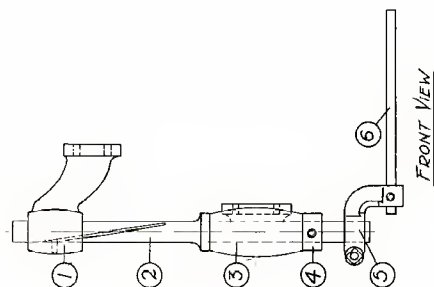
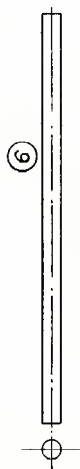
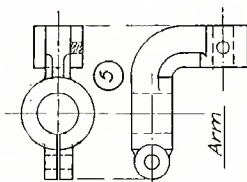
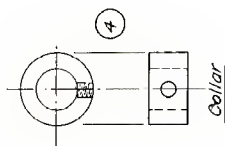
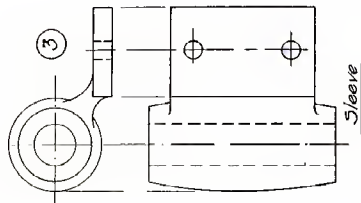
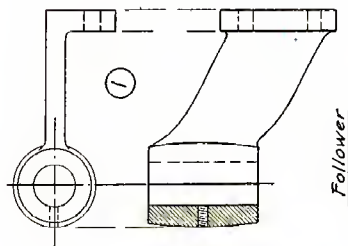
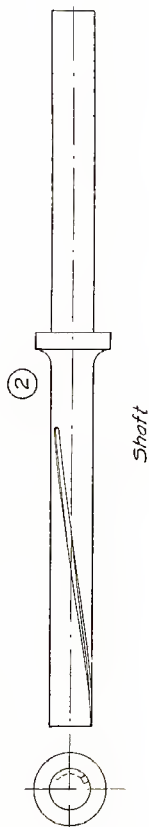
Checked By [Signature]

Approved By [Signature]

INCLINABLE STAMPING PRESS



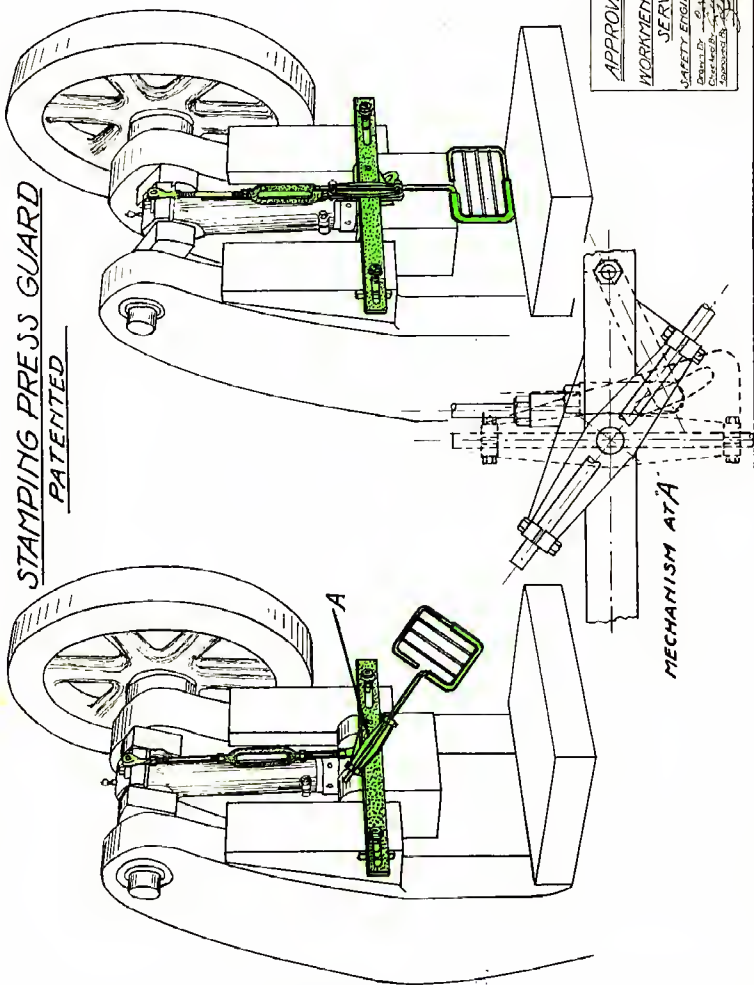
APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
 DRAWN BY C. J. L.
 CHECKED BY W. J. L.
 APPROVED BY W. J. L.



APPROVED STANDARD
 WORKMENS COMPENSATION
 SERVICE BUREAU
 SAFETY ENGINEERING DEPARTMENT
 CHICAGO, ILL.
 Approved by W. H. H. H. H. H. 10/21/18

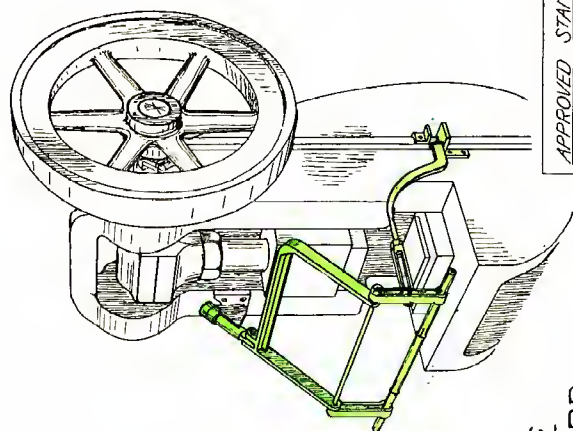
STAMPING PRESS GUARD PATENTED

STAMPING PRESS GUARD
PATENTED

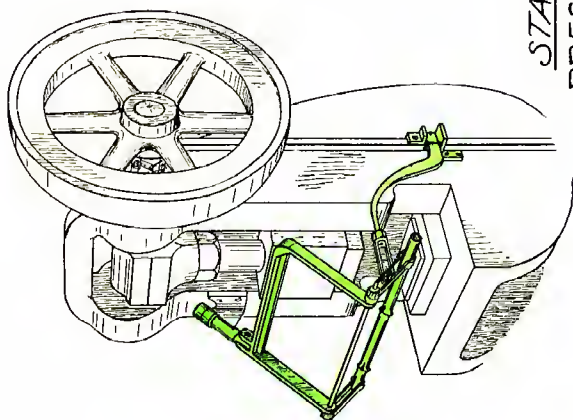


APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT

Drawn by W. H. H. H.
Checked by W. H. H. H.
Approved by W. H. H. H.
Date 10-23-17

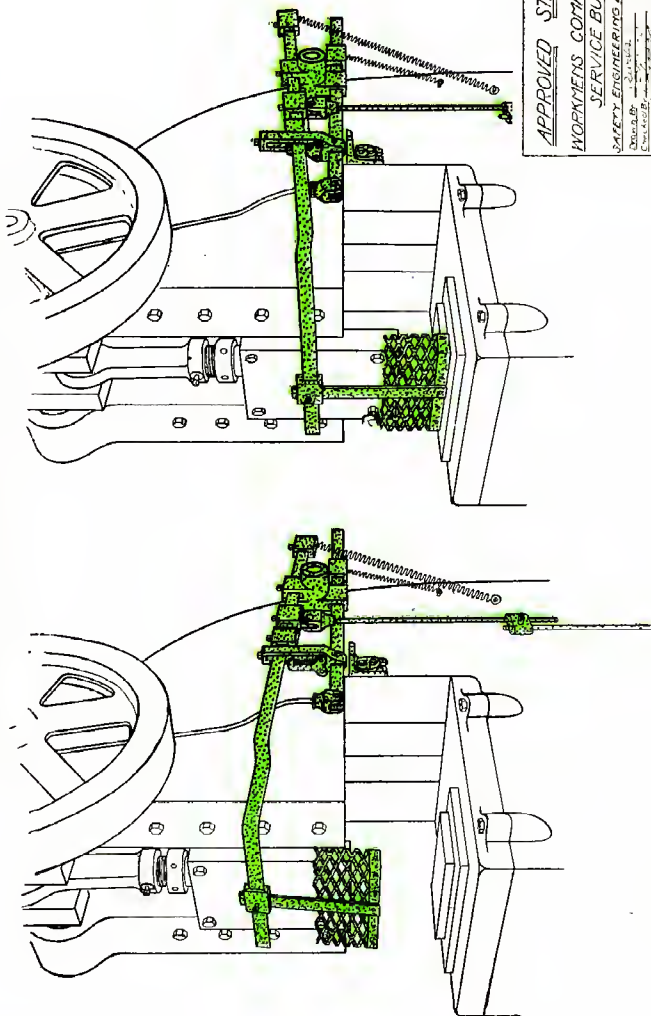


STAMPING PRESS GUARD

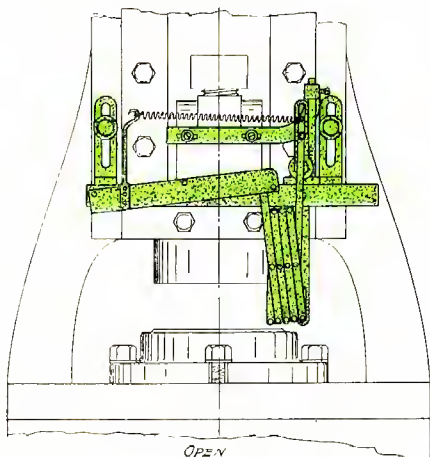


APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
RECEIVED BY _____
DATE _____
APPROVED BY _____
DATE _____

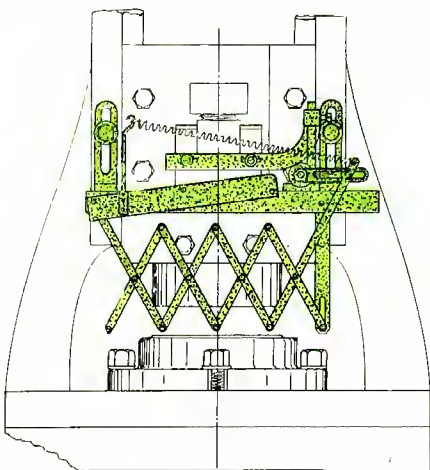
STAMPING PRESS GUARD PATENTED



APPROVED STANDARD
 WORKMENS COMPENSATION
 SERVICE BUREAU
 SAFETY ENGINEERING DEPARTMENT
 Date: Apr 1 1918
 By: [Signature]
 Title: [Signature]
 [Signature]



OPEN

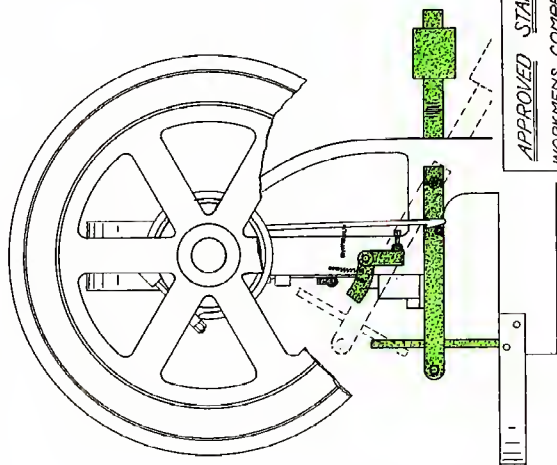
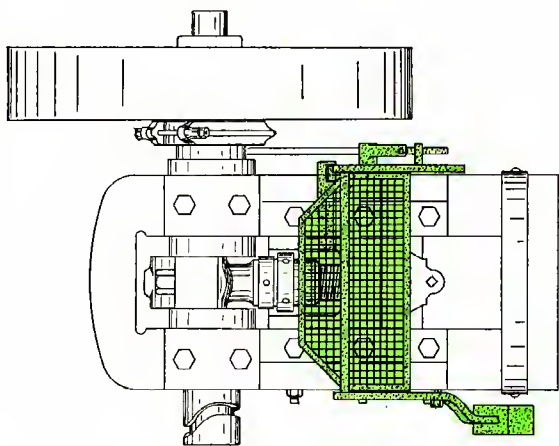


CLOSED

HORIZONTAL FOLDING
GATE GUARD
PATENTED

APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
Checked By 12/24/24
Described By 12/24/24
Inspected By 12/24/24

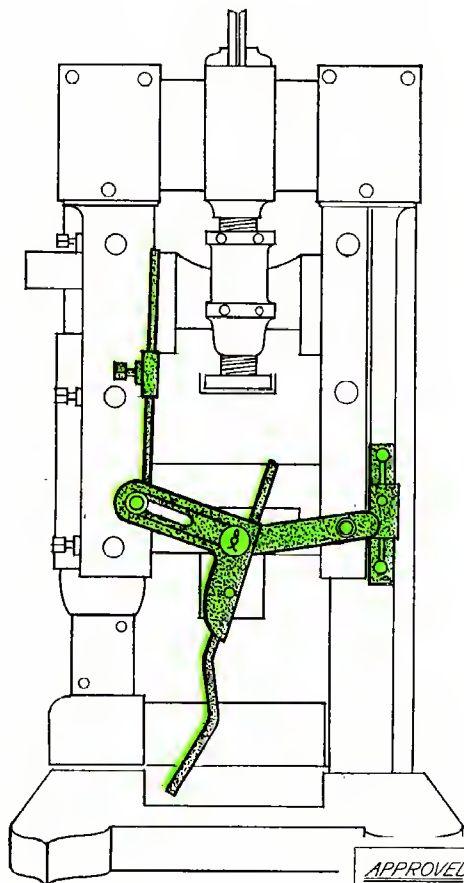
PUNCH PRESS GUARD PATENTED



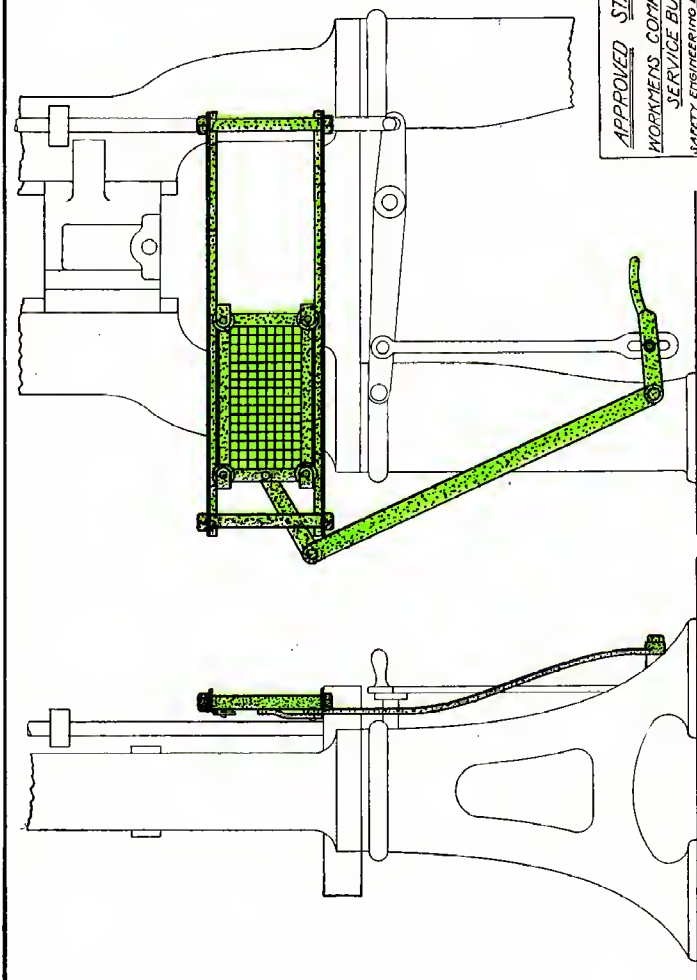
APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
 SAFETY ENGINEERING DEPARTMENT
 Drawn By: *[Signature]*
 Checked By: *[Signature]*
 Approved By: *[Signature]*

STAMPING PRESS GUARD

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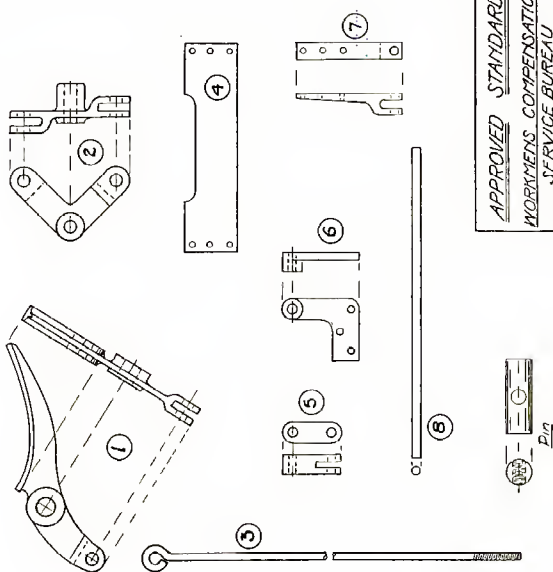
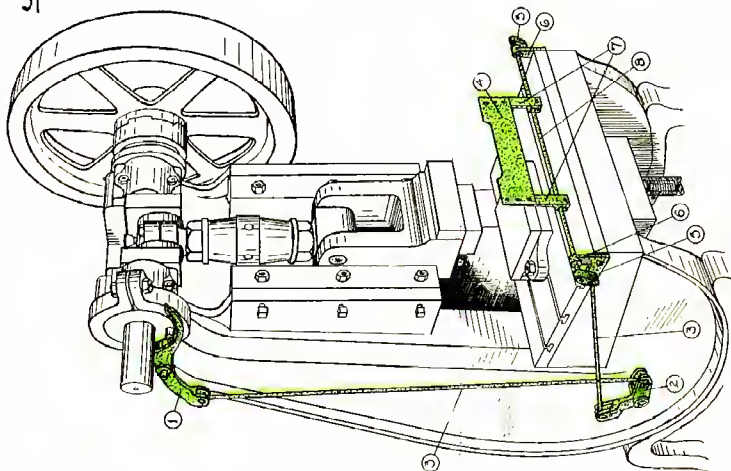
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WORKMENS COMPENSATION
SERVICE BUREAU
 SAFETY ENGINEERING DEPARTMENT
 Drawn By W. H. S.
 Checked By W. H. S.
 Approved By W. H. S.



APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
 Drawn By W. H. H. H.
 Checked By W. H. H. H.
 Approved By W. H. H. H.

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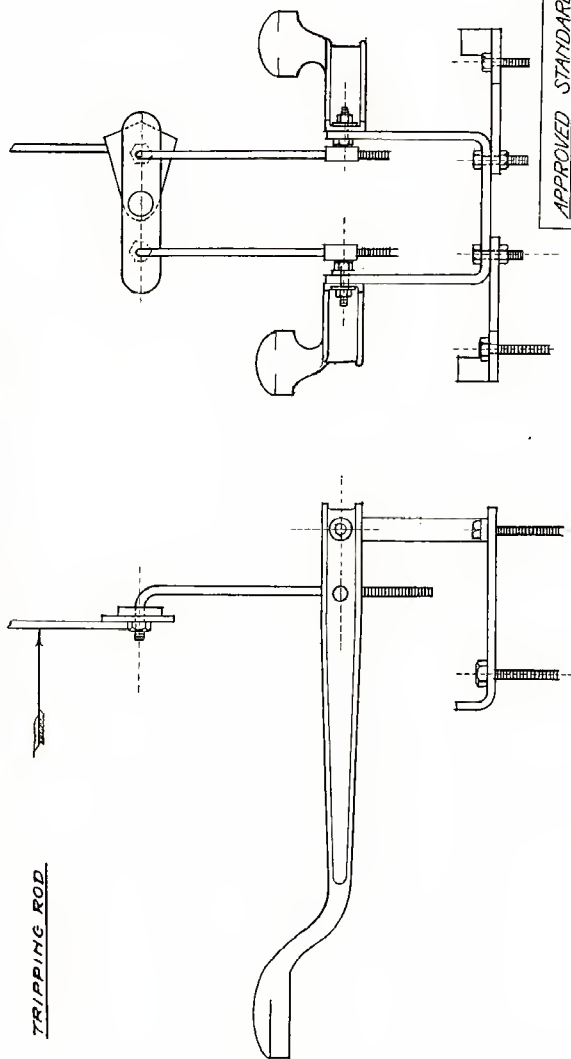
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TRIPPING ROD



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WORKMENS COMPENSATION
SERVICE BUREAU

SAFETY ENGINEERING DEPARTMENT

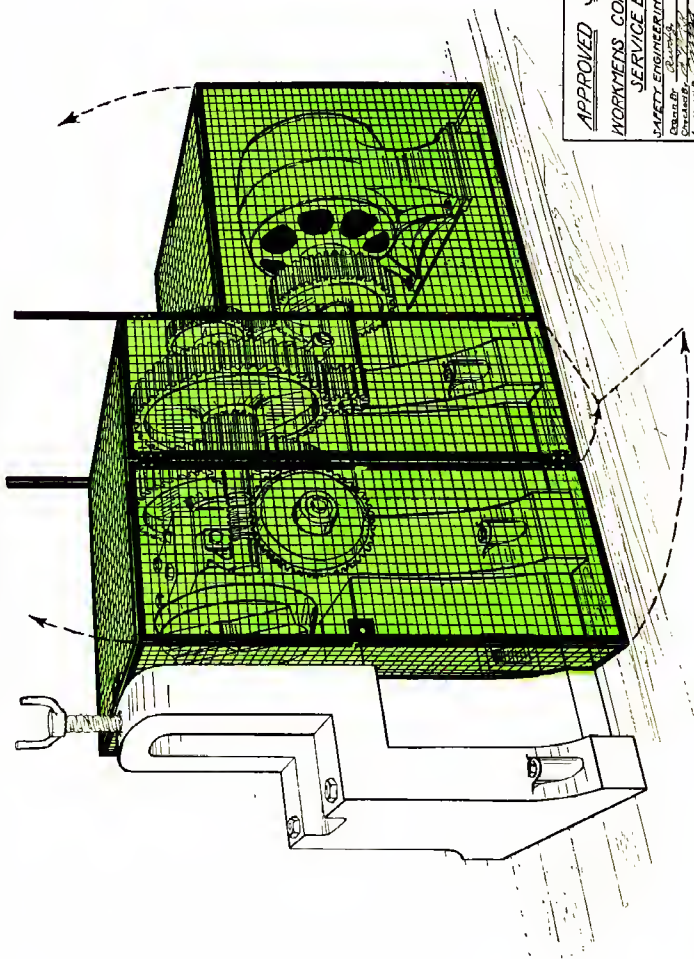
DESIGNED BY: *W. H. S.*

CHECKED BY: *W. H. S.*

APPROVED BY: *W. H. S.*

DATE: *11/29/18*

RAIL ENDING MACHINE



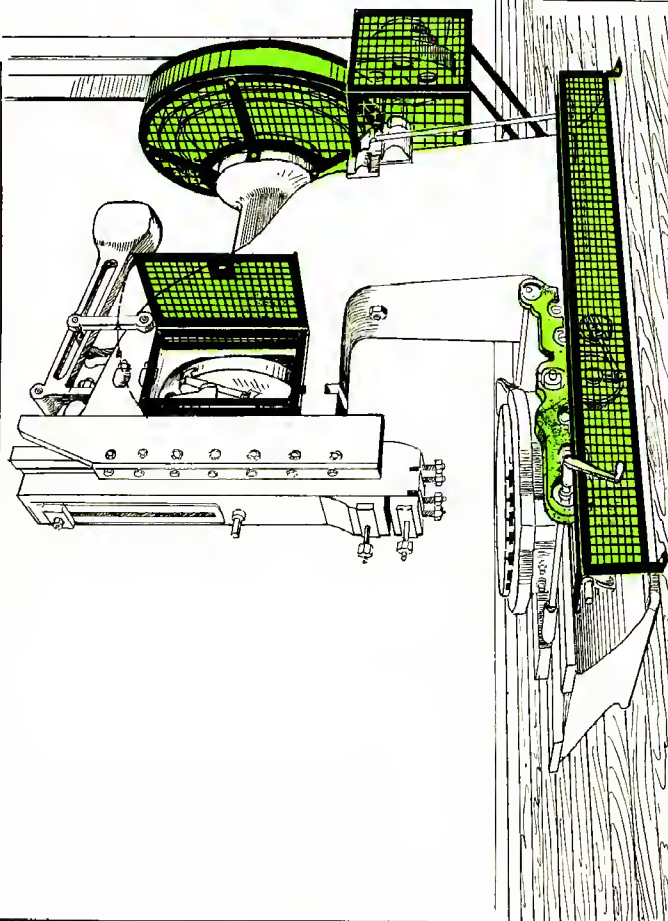
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WORKMENS COMPENSATION
SERVICE BUREAU

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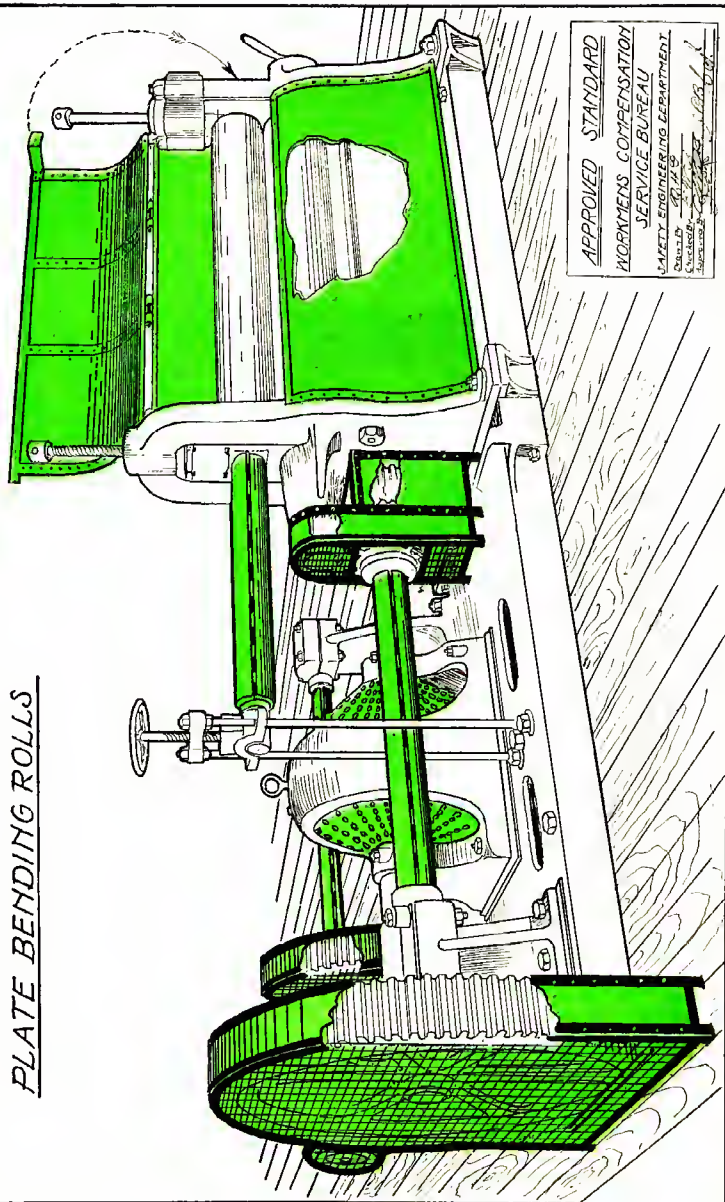
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EXTRA HEAVY SLOTTING MACHINE



APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
Checked By W. J. H. S.
Approved By W. J. H. S.
Date 10/10/19

PLATE BENDING ROLLS



APPROVED STANDARD

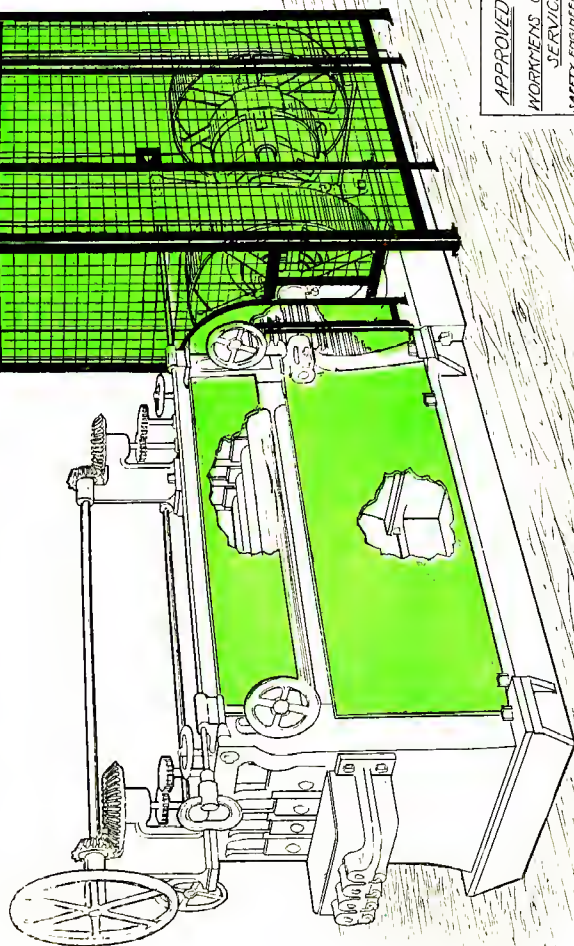
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SERVICE BUREAU

SAFETY ENGINEERING DEPARTMENT

Quincy, Ill.
Chicago, Ill.

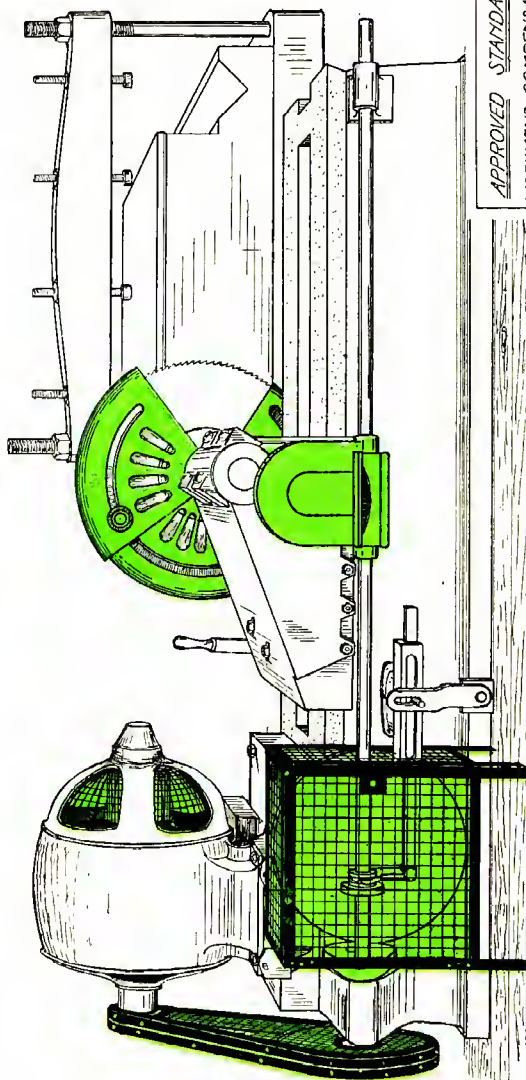
Approved by the
Safety Engineering Department

PLATE STRAIGHTENING ROLLS



APPROVED STANDARD
 WORKMENS COMPENSATION
 SERVICE BUREAU
 SAFETY ENGINEERING DEPARTMENT
 CHAIRMAN
 GEORGE B. HAY
 CHAIRMAN
 GEORGE B. HAY
 CHAIRMAN
 GEORGE B. HAY

COMBINATION GOLD SAW CUTTING-OFF MACHINE



APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU

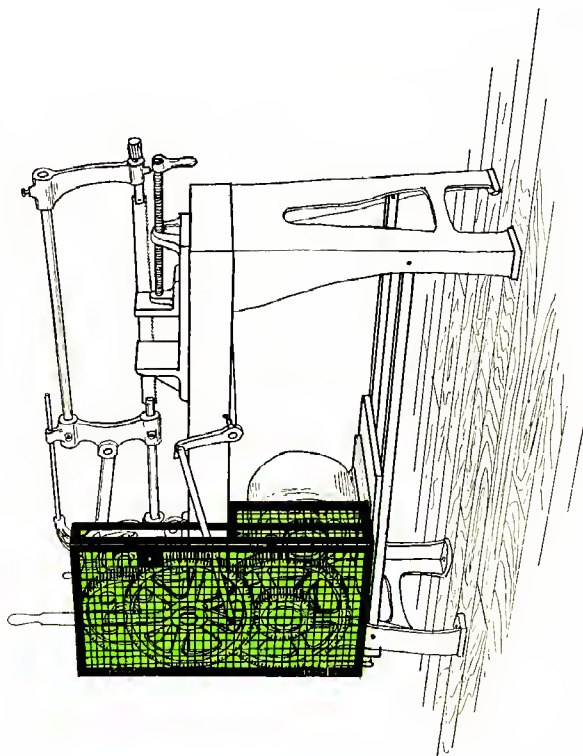
SAFETY ENGINEERING DEPARTMENT

Drawn by: *[Signature]*

Checked by: *[Signature]*

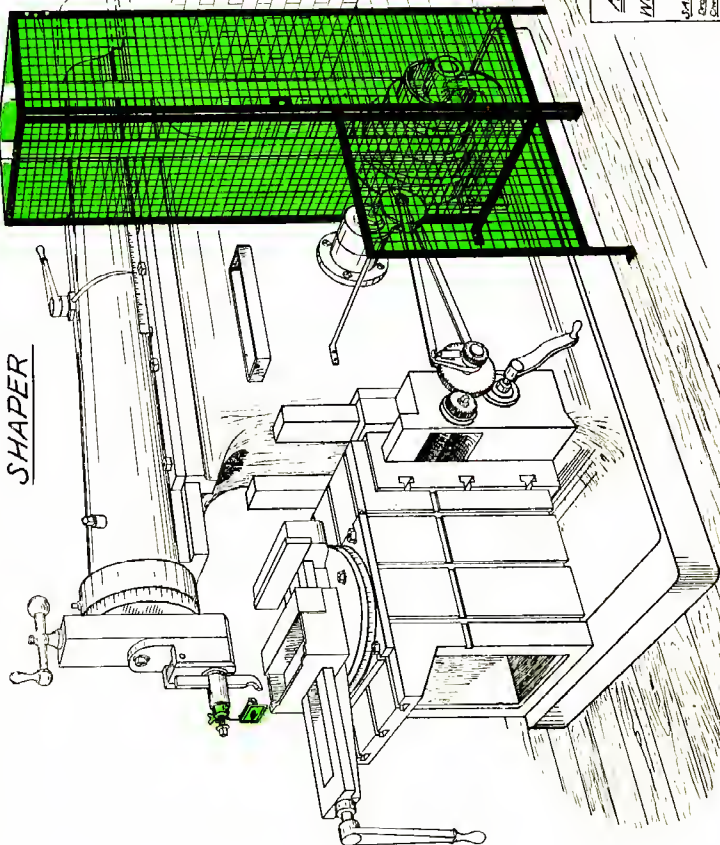
Approved by: *[Signature]*

POWER HACK SAW



APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY-ENGINEERING DEPARTMENT
Drawn By W. H. C.
Checked By W. H. C.
Approved By W. H. C.

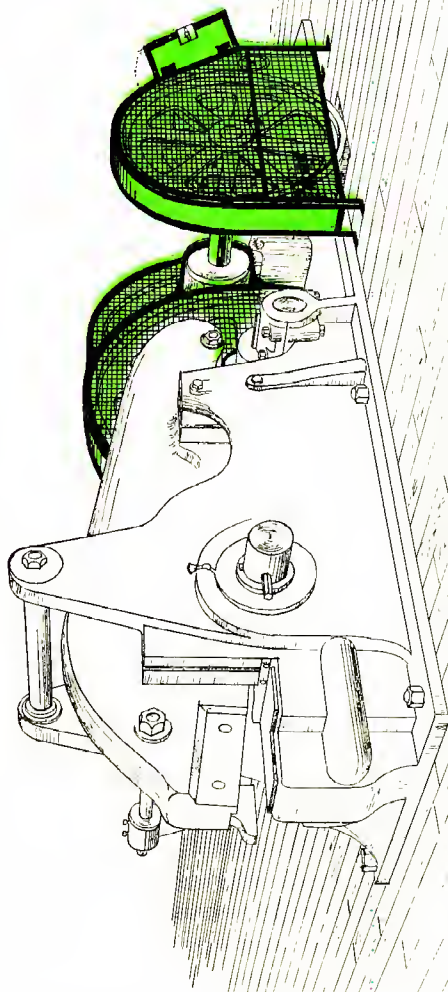
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APPROVED STANDARD
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SERVICE BUREAU

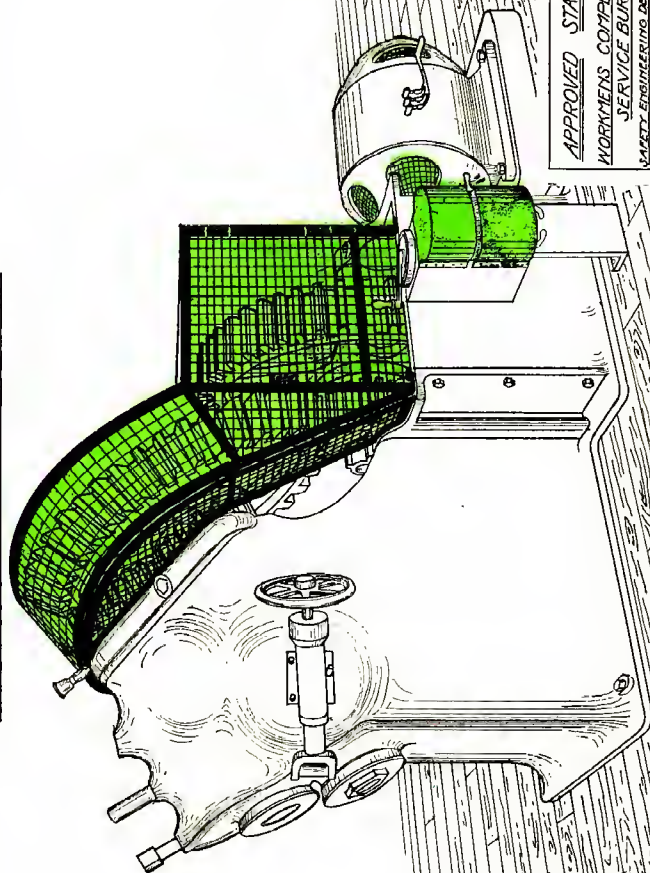
SAFETY ENGINEERING DEPARTMENT
DESIGNED BY
CHECKED BY
APPROVED BY

ALLIGATOR SHEARS



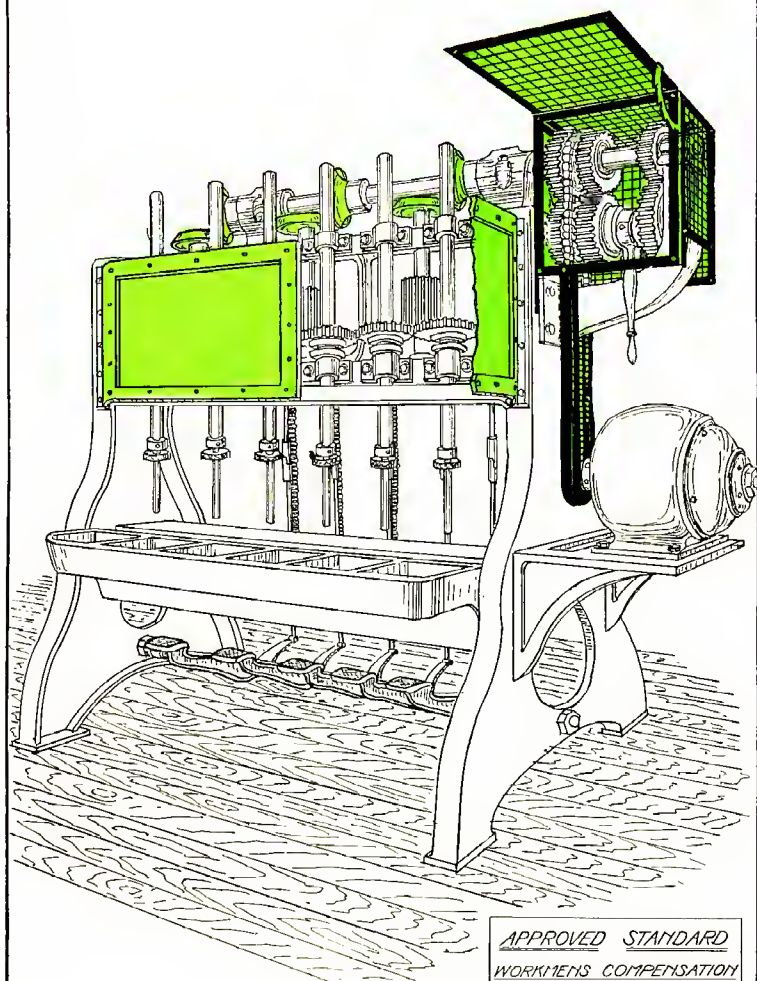
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WORKMENS COMPENSATION
SAFETY ENGINEERING DEPARTMENT
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 CHECKED BY W. J. B. 1
 APPROVED BY W. J. B. 1

ROTARY BEVELING SHEARS



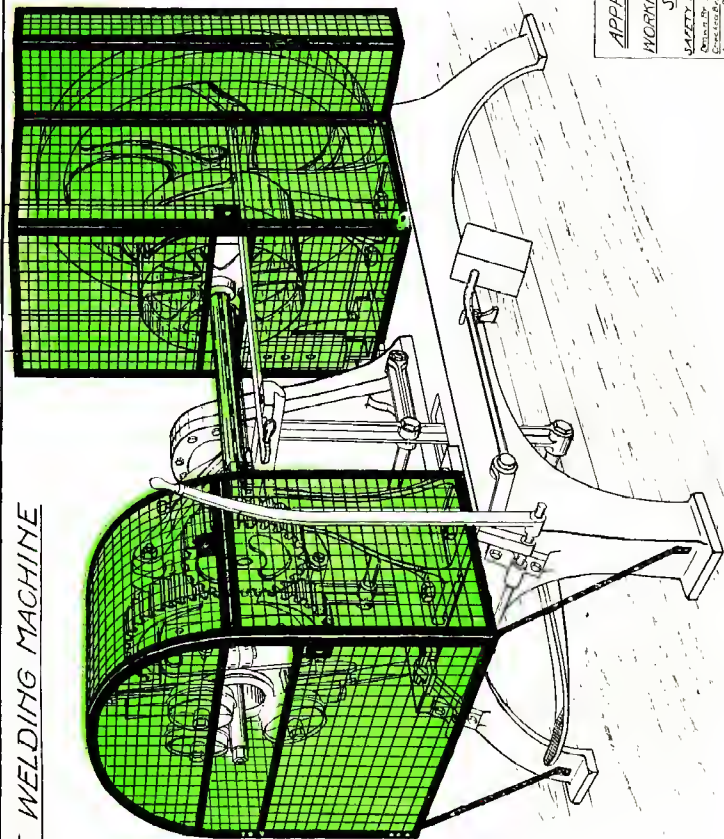
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WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
Approved By: *[Signature]*
Checked By: *[Signature]*
Decided By: *[Signature]*

SIX SPINDLE NUT TAPPER



APPROVED STANDARD
WORKMEN'S COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
 Drawn By 0334 D.
 Checked By 0334 D.
 Approved By [Signature]

FLUE WELDING MACHINE



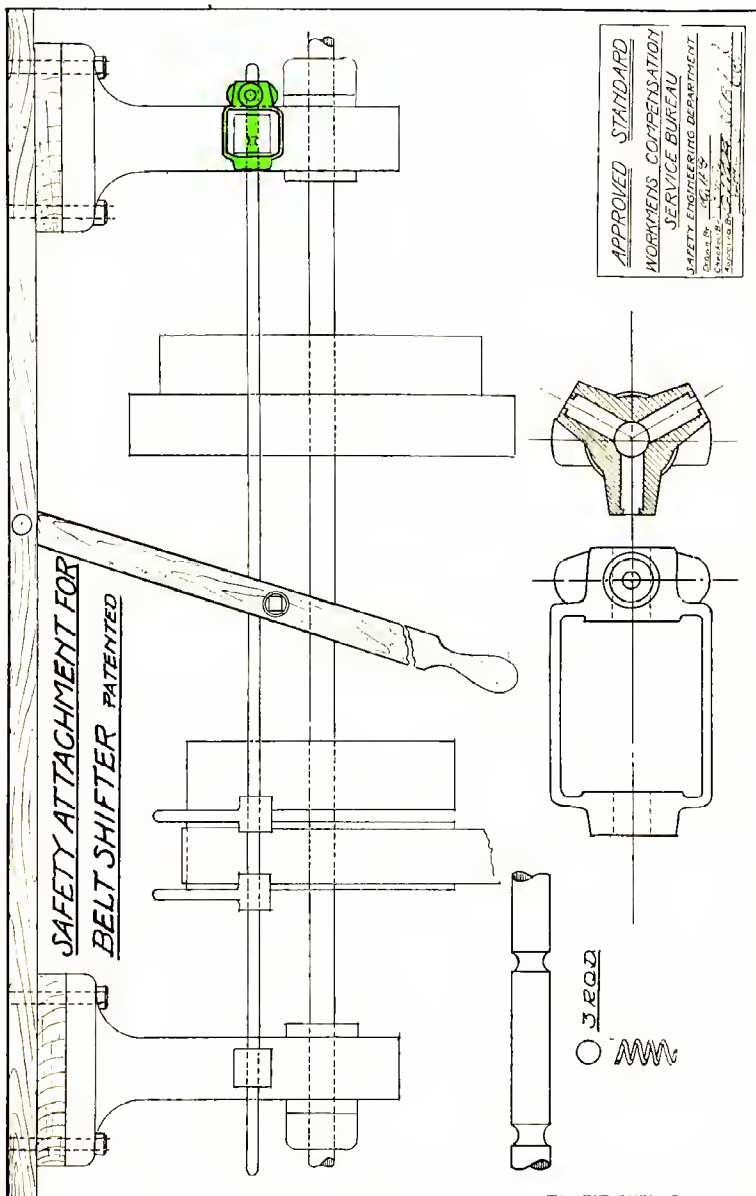
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SERVICE BUREAU

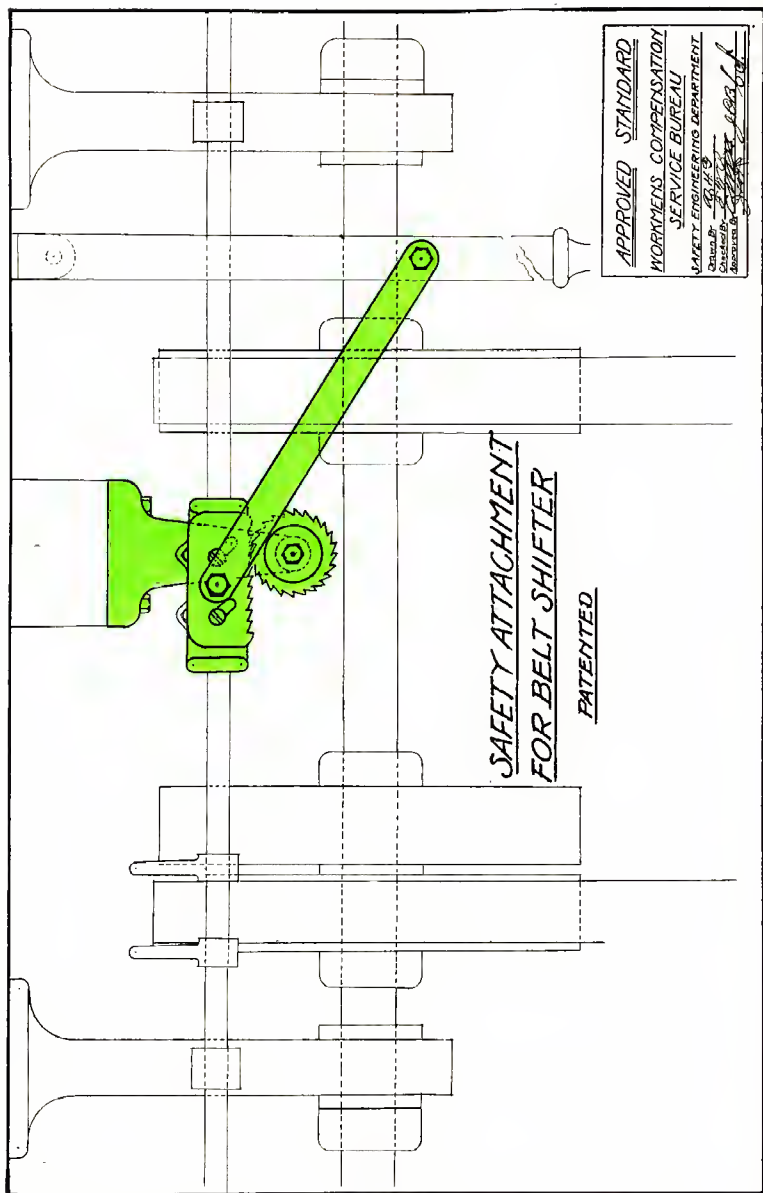
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Question No. 3 1174-10

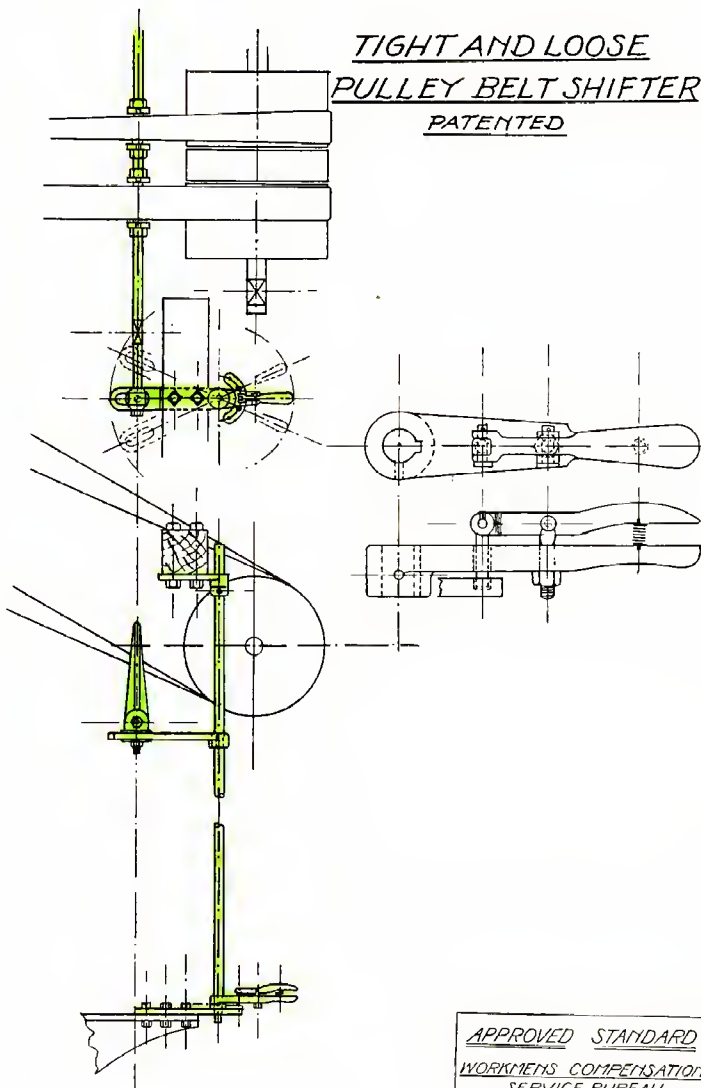
Correct Answer 3

Source of the Question 1174-10

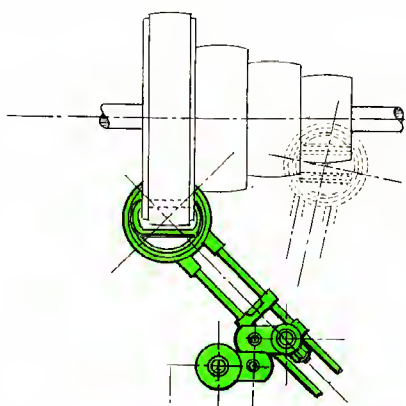




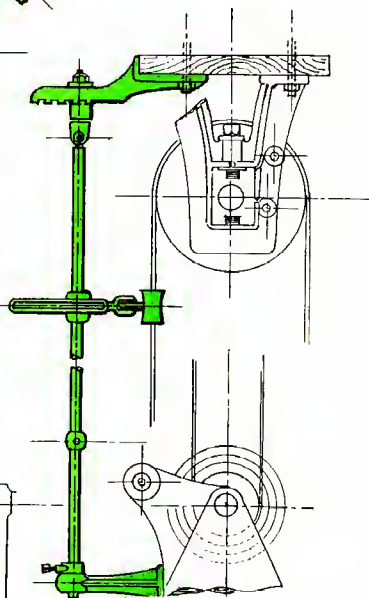
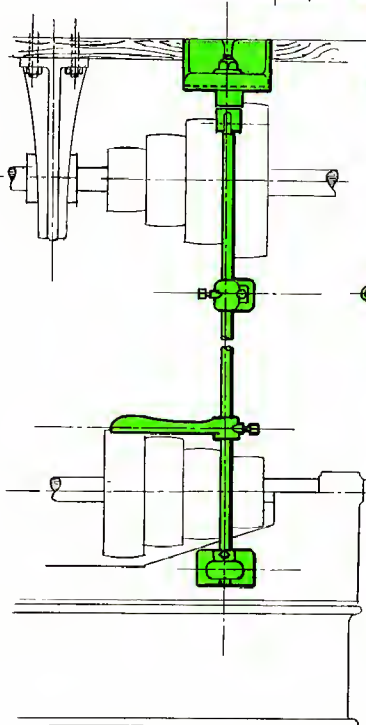
TIGHT AND LOOSE
PULLEY BELT SHIFTER
PATENTED



APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
Drawn by 1480
Checked by 1480
Approved by 1480

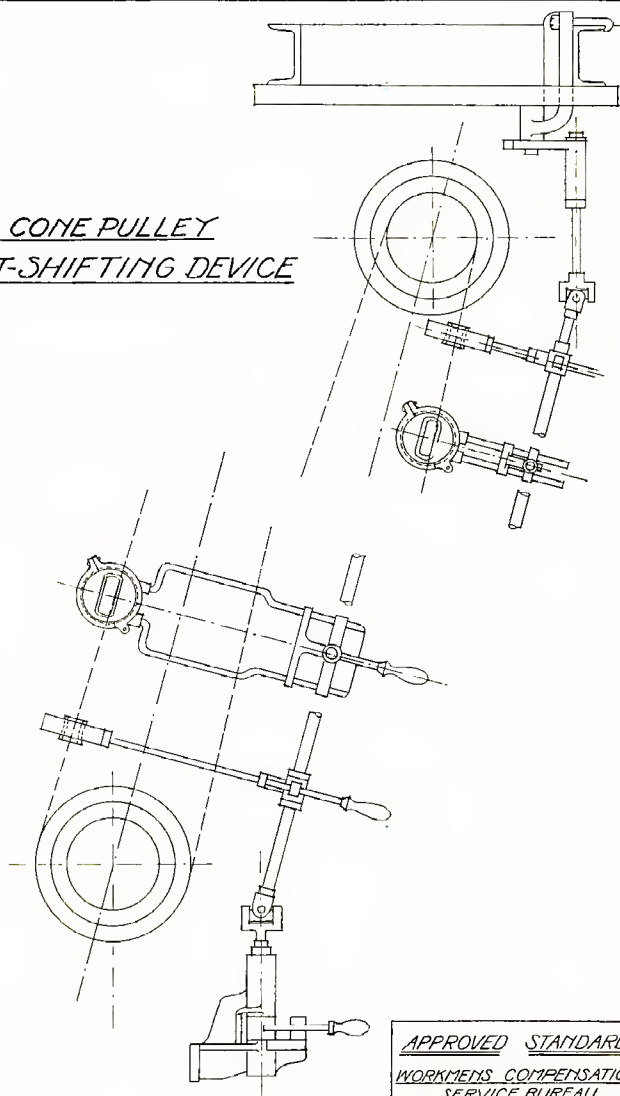


CONE PULLEY
BELT SHIFTER
PATENTED



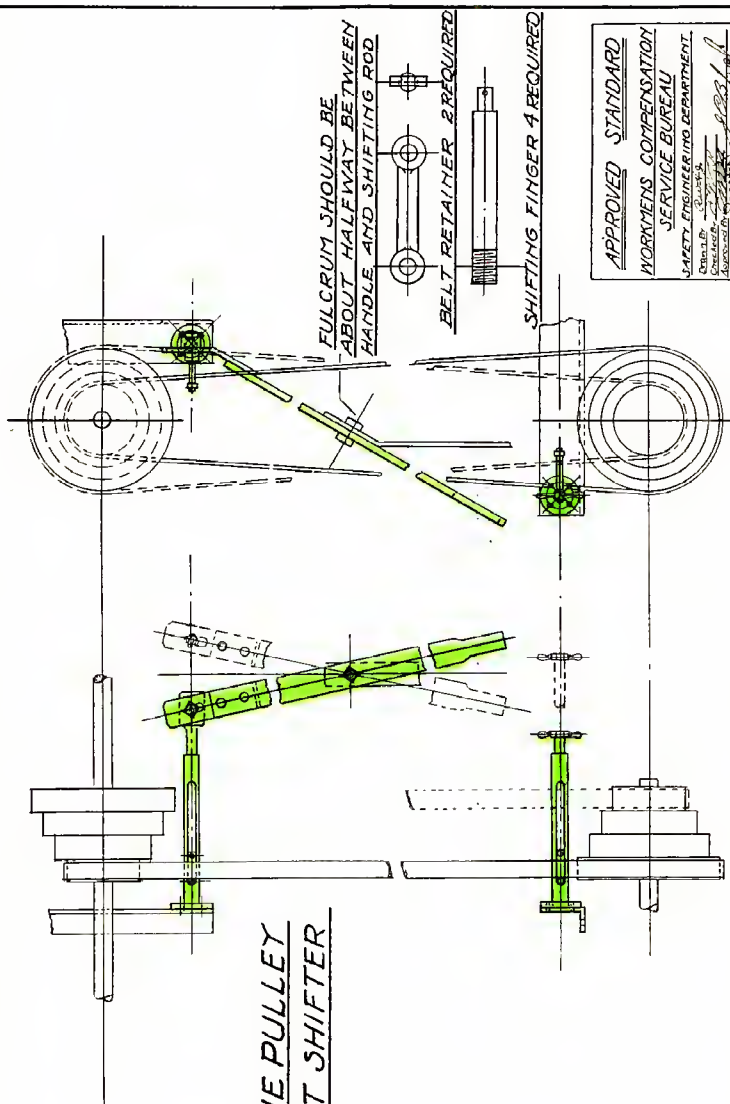
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WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
Examined By C. H. B.
Checked By C. H. B.
Approved By C. H. B.

CONE PULLEY
BELT-SHIFTING DEVICE



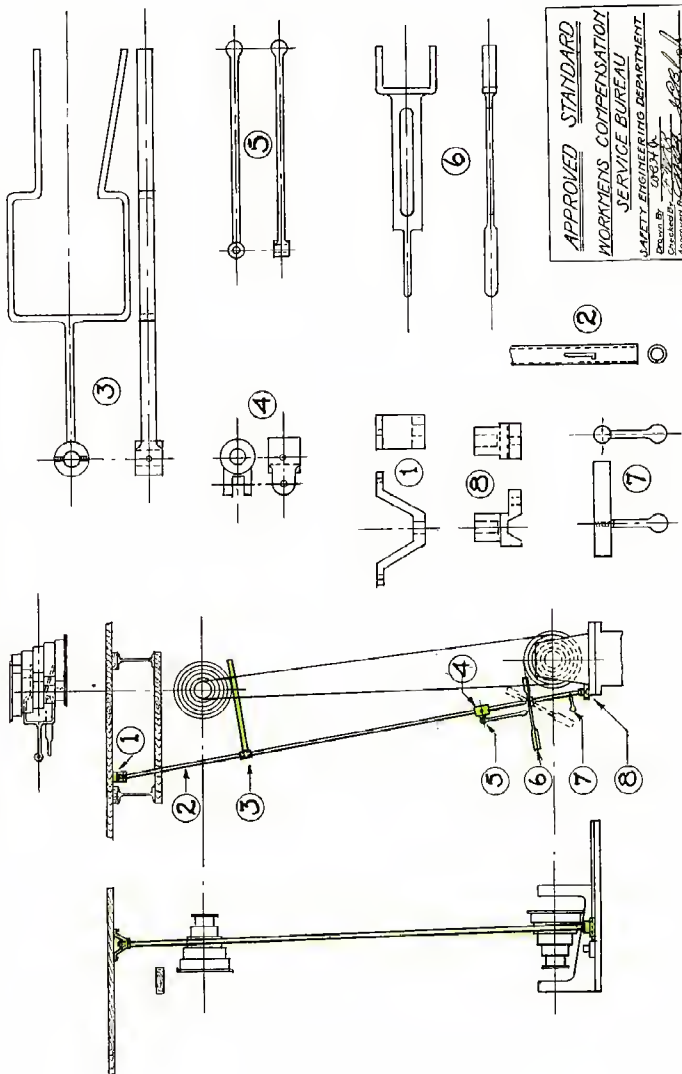
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WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
Drawn By STP
Checked By STP
Approved By STP

CONE PULLEY BELT SHIFTER



APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
 DIVISION OF LABOR
 DEPARTMENT OF COMMERCE
 APPROVED BY W. H. HARRIS
 DATE 10/1/19

CONE PULLEY BELT SHIFTER



APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT

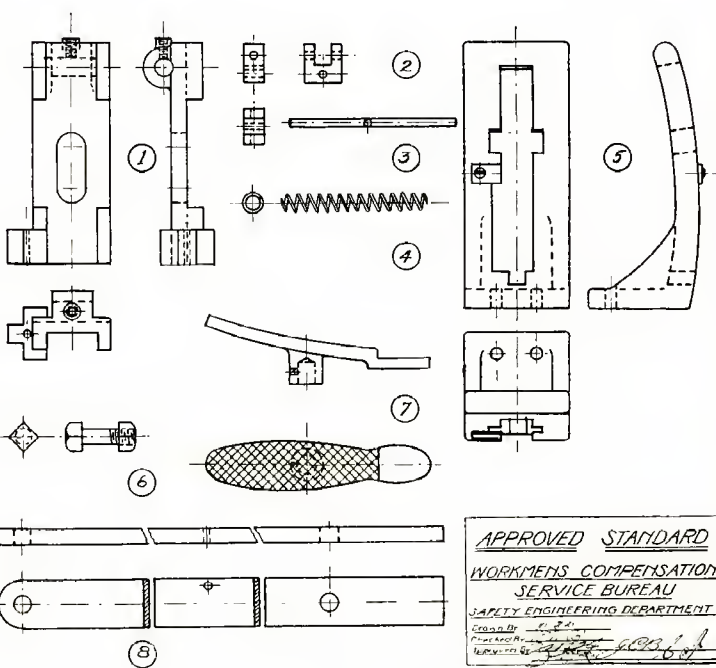
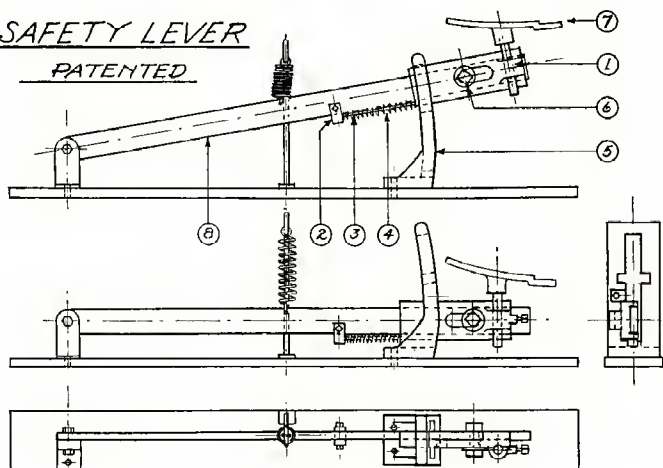
SAFETY ENGINEERING 10/24/20

Drawn by W. A. D.
Checked by W. A. D.

Small Business

SAFETY LEVER

PATENTED



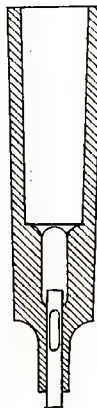
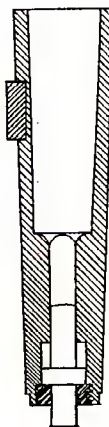
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WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
 Created By W. J. H.
 Checked By W. J. H.
 Approved By W. J. H.
 Date 1914-10-14

SAFETY DRILL SOCKET

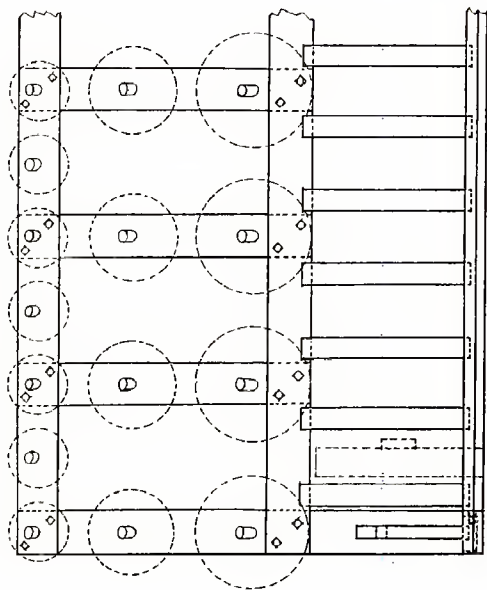
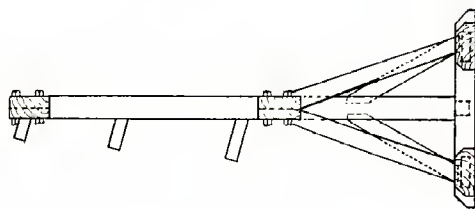
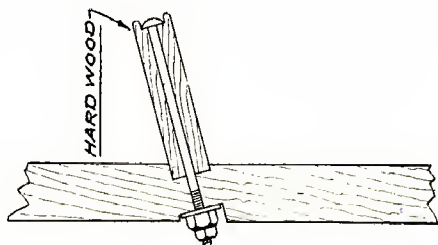
FOR LATHES



FOR DRILL PRESS



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WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
 Drawn By W. H. B.
 Checked By W. H. B.
 Approved By W. H. B.



APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU

SAFETY ENGINEERING DEPARTMENT

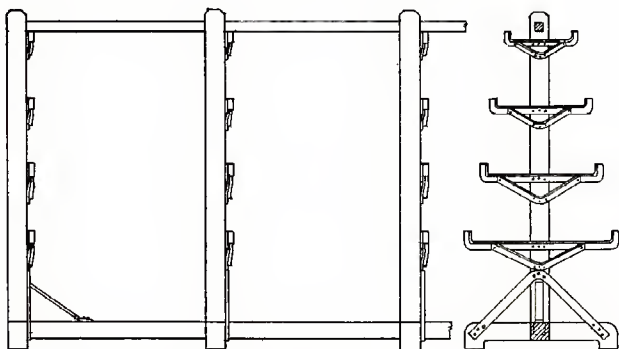
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CHECKED BY *[Signature]*

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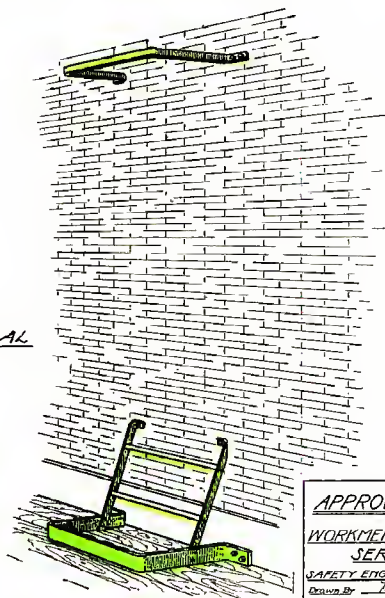
RACK FOR CHUCKS AND FACE-PLATES

BAR STOCK AND PIPE RACKS



FOR HORIZONTAL STORING

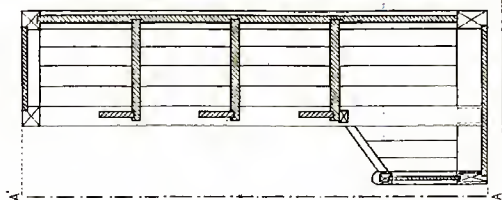
FOR VERTICAL
STORING



<u>APPROVED STANDARD</u>	
<u>WORKMENS COMPENSATION</u>	
<u>SERVICE BUREAU</u>	
<u>SAFETY ENGINEERING DEPARTMENT</u>	
Drawn By	<u>W.H.C.</u>
Checked By	<u>W.H.C.</u>
Approved By	<u>W.H.C.</u>

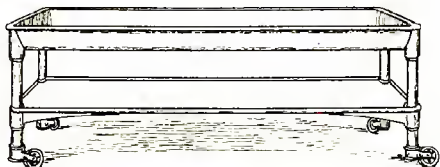


BINS FOR PIPE FITTINGS AND
SMALL CASTINGS



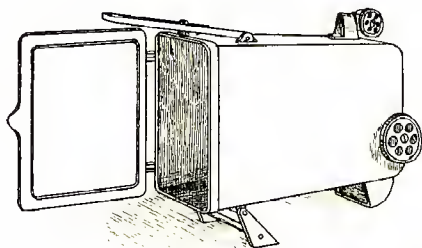
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WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
Checked By: *W.H.F.*
Designed By: *W.H.F.*
Drawn By: *W.H.F.*

SHOP FURNITURE

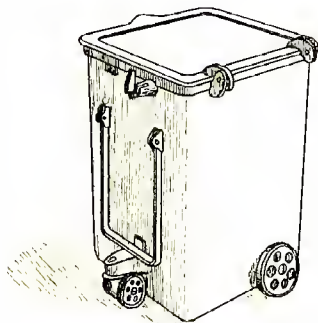


LATHE PAN DOUBLE TYPE

FIRE PROOF WASTE
CAN



IN POSITION FOR CLEANING



IN POSITION FOR USE

APPROVED STANDARD

WORKMENS COMPENSATION
SERVICE BUREAU

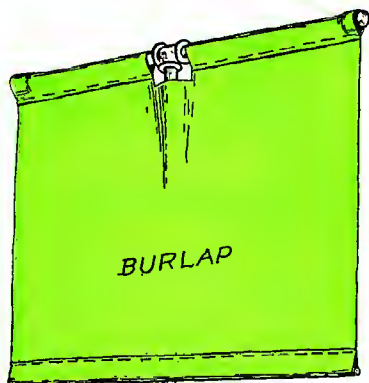
SAFETY ENGINEERING DEPARTMENT

Drawn By E.H.H.

Checked By E.H.H.

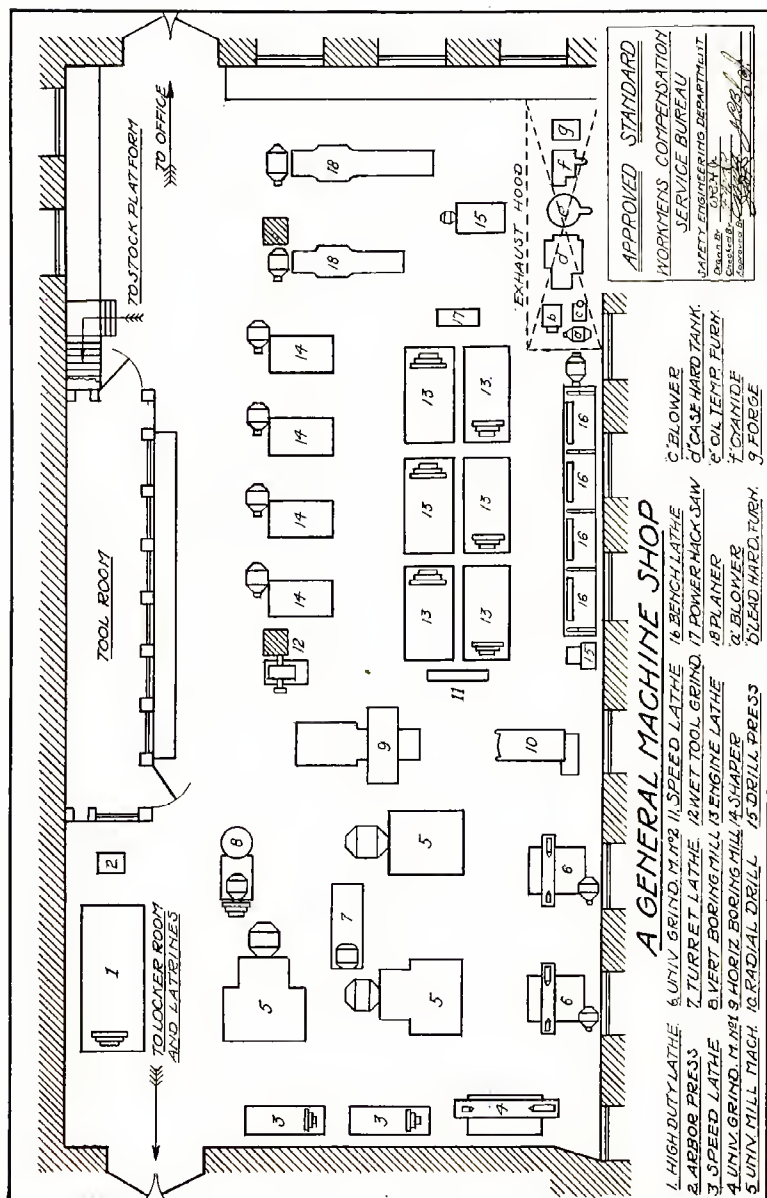
Approved By E.H.H.

BURLAP CHIPPING SHIELD



TO BE PLACED IN FRONT
OF CHIPPER AND ADJUST-
ABLE TO ANY SUITABLE
HEIGHT.

APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
1480
Designed By W. H. H. H.
Checked By W. H. H. H.
Approved By W. H. H. H.



PART III.
THE FOUNDRY

Principles of Safeguarding

(See Page 113.)

Cupola Hoisting and Charging Platform

(See Page 251.)

Gantry Crane

(See Page 252.)

1. All dangerous or moving parts to be guarded as shown.
2. Trolley to be guarded. (See Page 257.)
3. Safety limit stop to be applied. (See Pages 258 to 261.)
4. Walk-ways to be eighteen (18) inches in clear.
If construction of crane does not allow this, special provision to be made. (See Page 256.)
5. Cab to be enclosed to protect operator from weather, provision being made to allow him an uninterrupted view of the yards and track.

Interior Traveling Crane

(See Page 253.)

1. All dangerous or moving parts to be guarded as shown.
2. Trolley to be guarded. (See Page 257.)
3. Safety limit stop to be applied. (See Pages 258 to 261.)
4. Walkways to be eighteen (18) inches in the clear.
If construction of crane does not allow this, special provision to be made. (See Page 256.)

Crane Buffer

(See Page 254.)

Portable Rail Stop and Safety Lock for Operating Lever

(See Page 255.)

Walk-ways and Islands of Safety

(See Page 256.)

Crane Trolley

(See Page 257.)

1. All openings in motor exposing rotating or live parts to be covered.
2. Control for all motors to be located in the cab.
3. All power driven gears to be completely enclosed.
4. All brake drums to be guarded.
5. Prong or chain guard to be applied to truck wheels.

Safety Limit Switches

(See Pages 258 to 261.)

1. Safety limit switches, to be applied to all electric hoists, so designed and constructed that block will be brought to rest before it reaches the winding drum.

Track Guard

(See Page 262.)

Reservoir Ladle

(See Page 263.)

1. All openings in motor exposing rotating or live parts to be covered.
2. All power driven gears, including trunnion gear hub, to be completely enclosed.

Crane Ladle

(See Page 264.)

1. All gears, including trunnion gear hub, to be completely enclosed.
2. Safety locking device for holding ladle in upright position to be applied.

Safety Foundry Ladle

(See Page 265.)

1. Ladle to be counterweighted sufficiently to return it into upright position.
2. Truck to be equipped with prong guard.

Bull Ladle

(See Page 266.)

1. Ladle to be held in yoke by clamps.
2. Double handles, with swivel joint to be applied to only one end of yoke.

Ladle Hook and Ladle Shield

(See Page 267.)

Hook Dimensions

(See Page 268.)

Safety Clamps

(See Page 269.)

Slings and Chains

(See Pages 270, 271.)

Pneumatic Hoists

(See Pages 272, 273.)

1. Each hoist to be equipped with efficient brake, preventing slippage at any point.
2. Each hoist to be provided with an automatic limit stop.

Foundry Sand Mixer (Belt Driven)

(See Page 274.)

1. Driving belt to be guarded to height of six (6) feet from floor.
2. Tight and loose pulley belt shifter to be equipped with automatic locking device. Lever to extend through guard.
3. All power driven gears to be completely enclosed.
4. Opening on top of mixing cylinder to be covered by grating of round stock, reinforced with scrap iron and equipped with free swinging discharging doors. Round stock to be not less than three-eighths ($\frac{3}{8}$) inch spaced not more than (2) inches on center, and to be reinforced sufficiently to insure rigidity.

Foundry Mixer and Grinder (Belt Driven)

(See Page 275.)

1. Driving clutch and pulley to be completely enclosed.
2. Clutch lever to be equipped with automatic locking device.
3. Driving gears to be completely enclosed.
4. Screen guard to completely surround tub extending well above grinding wheel hubs.
5. Feeding hopper to be applied to opening in screen guard.

Sand Sifter (Motor Driven)

(See Page 276.)

1. All openings in motor exposing rotating or live parts to be covered.
2. Safety switch and starting box to be applied. Safety switch to be located convenient to operator.
3. Railings of standard height to be placed along sides of rotating sifter, allowing six (6) inches clearance.

Automatic Molding Machine (Motor Driven)

(See Page 277.)

1. All openings in motor exposing rotating or live parts to be covered.
2. Safety switch and starting box to be applied. Starting box to be located convenient to operator.
3. All power driven gears to be completely enclosed.
4. Hammer connecting rods to be guarded as high as possible without interfering with adjustments.

5. Chains to stop traffic to be hooked from both sides of conveyor frame to convenient point on machine.
6. Counterweight to be guarded from floor to top of weight.

Continuous Exhaust Tumbling Mill

(See Page 278.)

1. Driving belt to be guarded to height of six (6) feet from floor.

Battery of Large Tumbling Barrels (Shaft Drive)

(See Page 279.)

1. Driving barrel shaft to be covered with shaft guard.
2. All power driven gears to be completely enclosed.
3. Each tumbling barrel to be provided with railing of standard height with fifteen (15) inches clearance. Automatic gate in railing to control starting and stopping mechanism of each tumbling barrel.
4. Each tumbling barrel to be equipped with efficient exhaust system. Base of flues to have clean-out doors.
5. Chain hoist for lifting covers of barrels to be provided.

Small Tumbling Barrel (Belt Driven)

(See Page 280.)

1. Driving belt to be guarded to height of six (6) feet from floor.

2. Entire barrel to be enclosed by railing having fifteen (15) inches clearance.
3. Tight and loose pulley belt shifting device to be operated by gate.
4. All power driven gears to be completely enclosed.
5. Chain hoist for lifting covers to be provided.

Housed Tumbling Barrel (Belt Driven)

(See Page 281.)

1. Entire barrel to be completely enclosed in sheet iron housing.
2. Driving belt to be guarded to height of six (6) feet from floor.
3. Belt shifter to be operated by automatic device connected with door. (See Page 282.)
4. Where double doors are used, the door operating belt shifter to be equipped with strap iron astragal to prevent the opening of the idle door first.
5. Tumbling barrel to be equipped with efficient exhaust. Base of exhaust flue to be provided with clean-out doors.
6. Chain hoist for lifting covers of barrels to be provided.

Belt Shifting Device for Enclosed Tumbler

(See Page 282.)

Sand Blast Chamber

(See Page 283.)

Car Wheel Guard and Track Skidder

(See Page 284.)

Shop Clothes

(See Page 285.)

Caps, Gloves and Shoes

(See Page 286.)

Goggles

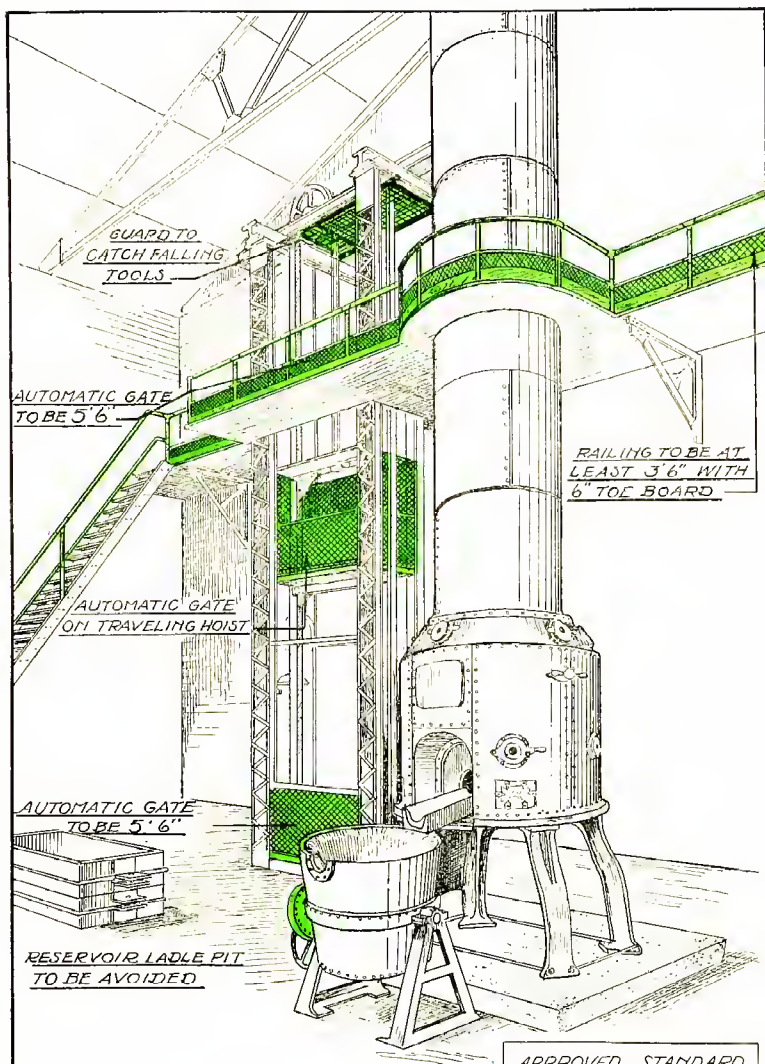
(See Page 287.)

Masks

(See Pages 288, 289, 290.)

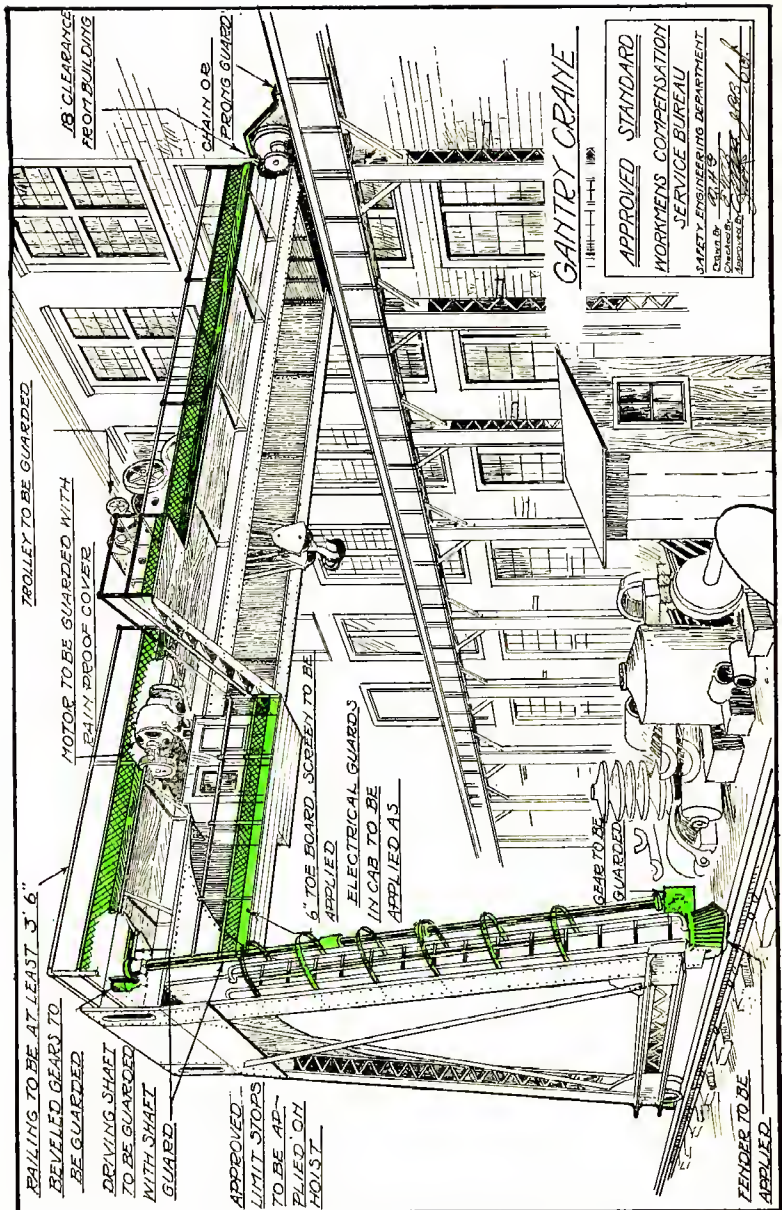
Pattern Making

For Standards covering pattern making machinery,
see “Wood Working Edition — Universal Safety
Standards.”



CUPOLA, HOIST AND
CHARGING PLATFORM

APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
 SAFETY ENGINEERING DEPARTMENT
 DIVISION OF MINES
 DEPARTMENT OF THE INTERIOR
 WASHINGTON, D. C.



APPROVED STANDARD
 WORKMENS COMPENSATION
 SERVICE BUREAU
 SAFETY ENGINEERING DEPARTMENT
 Created By
 Checked By
 Approved By
 Date

RAILING TO BE AT LEAST
3' 6" HIGH

TROLLEY TO BE GUARDED

DRIVING SHAFTS TO
BE GUARDED WITH
SHAFT GUARD

BRIDGE OVER MOTOR WITH
REMOVABLE STAIRS

6" OEE BOARD AND
SCREEN TO BE APPLIED

MOTOR AND GEARS TO BE
COMPLETELY GUARDED

COUPLINGS TO
BE GUARDED

CHAIN OR
PRONG GUARD
TO BE APPLIED

OVER HEAD FUSE BOX TO
BE GUARDED

SAFETY SWITCHES ON RHEOSTAT
DIRECTION OF MOTION TO BE
SHOWN BY ARROWS UNDER
CONTROLLER HANDLE

EACH CONTROLLER TO BE
PLAINLY DESIGNATED

APPROVED LIMIT STOPS TO
BE APPLIED ON HOIST

TRUNION LOCK

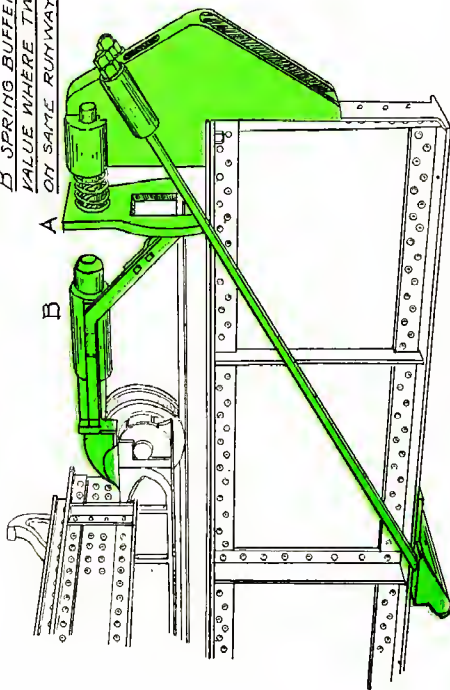
APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU

SAFETY ENGINEERING DEPARTMENT
FEDERAL BUREAU OF INVESTIGATION
U. S. DEPARTMENT OF JUSTICE
WASHINGTON, D. C.

INTERIOR TRAVELING CRANE

"A" DOUBLE COIL SPRING BUFFER

"B" SPRING BUFFER OF SPECIAL
VALUE WHERE TWO CRANES ARE
ON SAME RUNWAY



CRANE BUFFER AND STOP

APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU

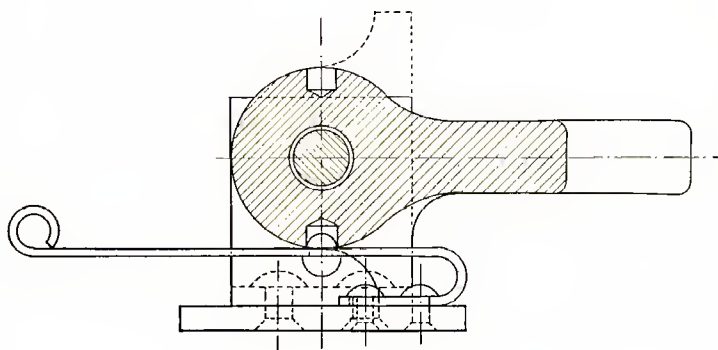
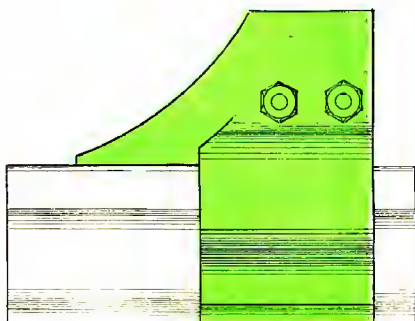
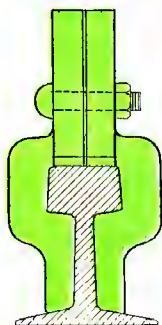
SAFETY ENGINEERING DEPARTMENT

CHAS. E. BROWN

CHICAGO, ILL.

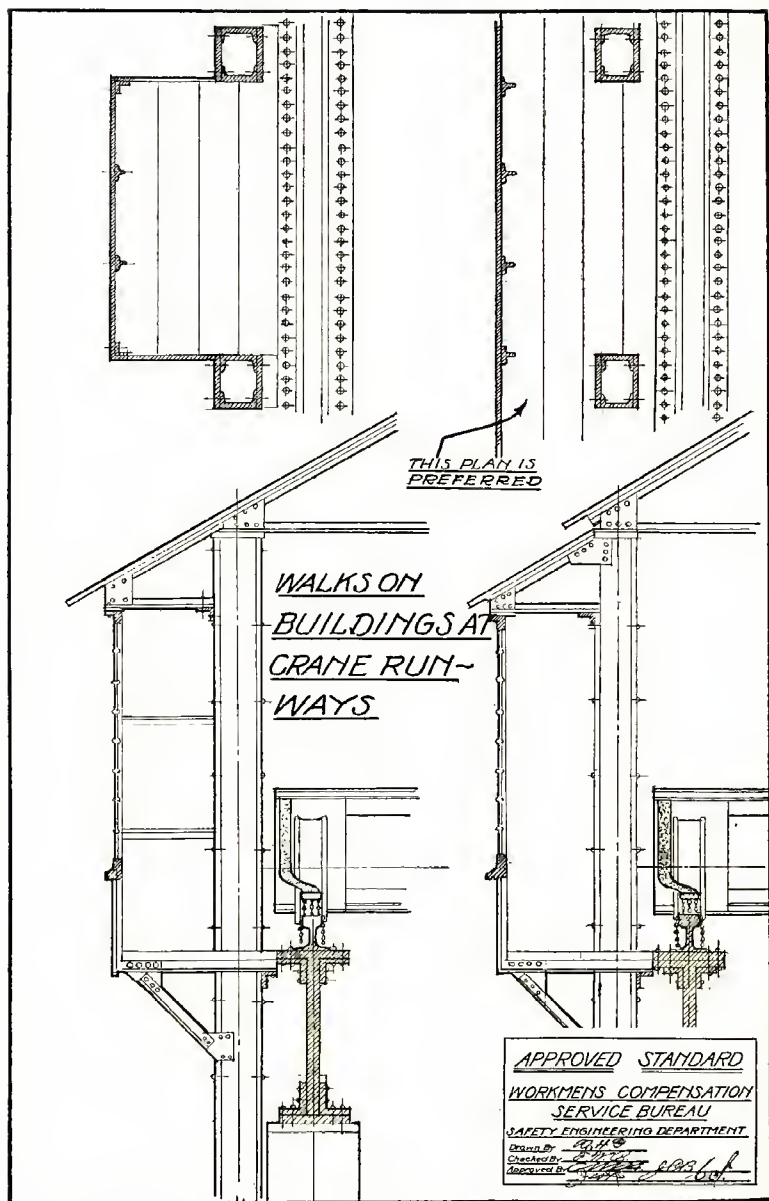
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PORTABLE RAIL STOP USED WHEN
REPAIRING CRANES

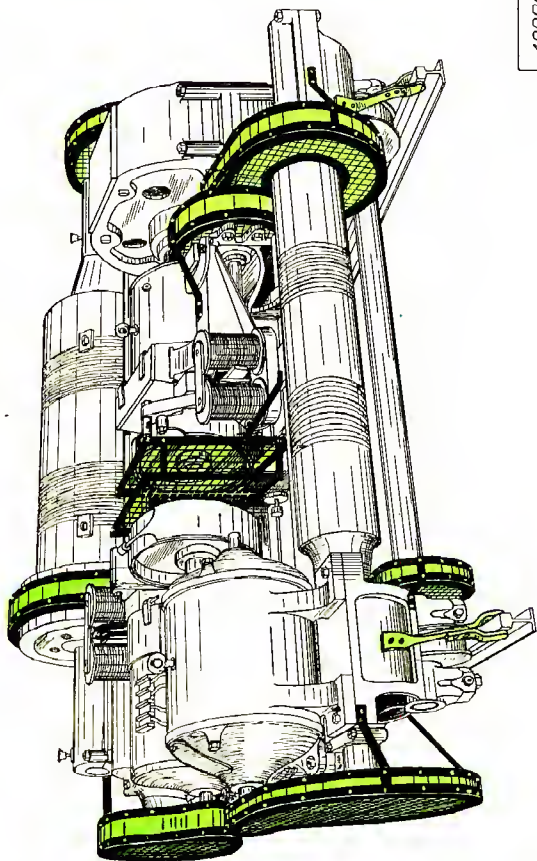


SAFETY LOCK FOR OPERATING
LEVER

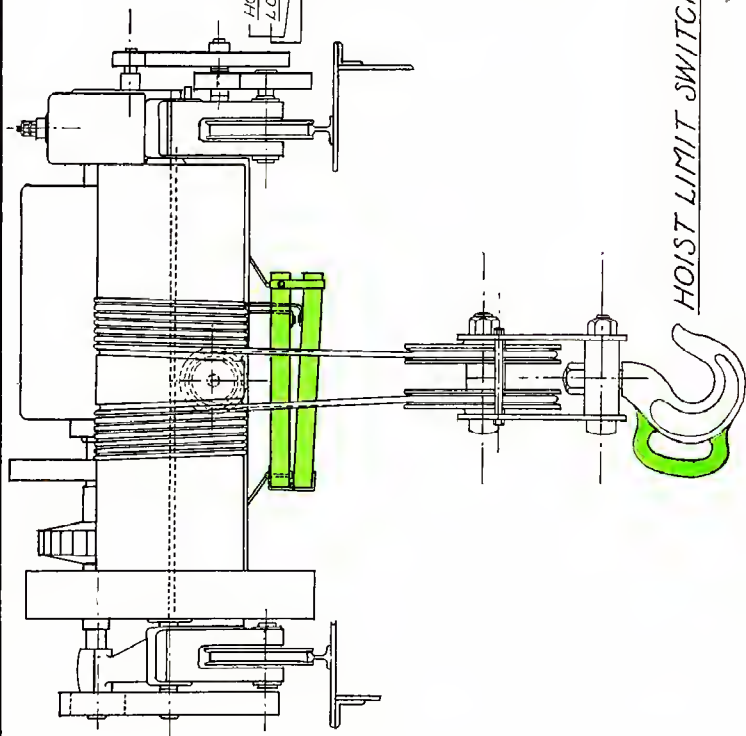
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WORKMENS COMPENSATION	
SERVICE BUREAU	
SAFETY ENGINEERING DEPARTMENT	
Checked By	10/11/52
Approved By	10/11/52



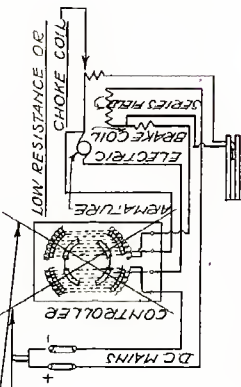
CRANE TROLLEY



APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
 Drawn By W. J. Smith
 Checked By W. J. Smith
 Approved By W. J. Smith



HOIST POSITION
LOWER POSITION

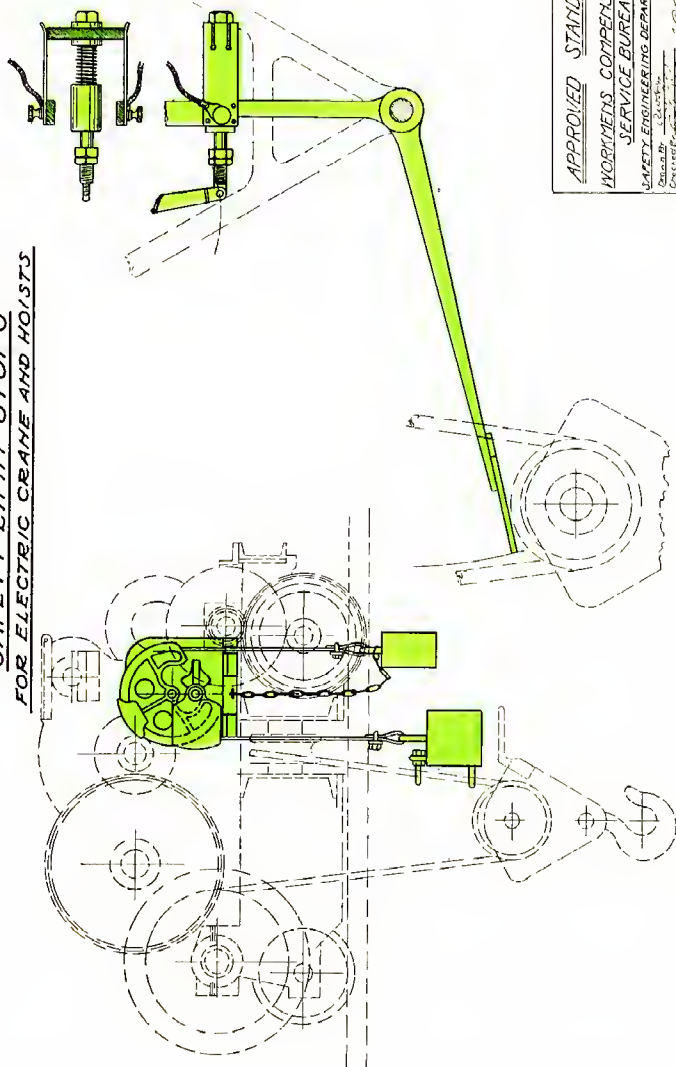


WIRING DIAGRAM

HOIST LIMIT SWITCH

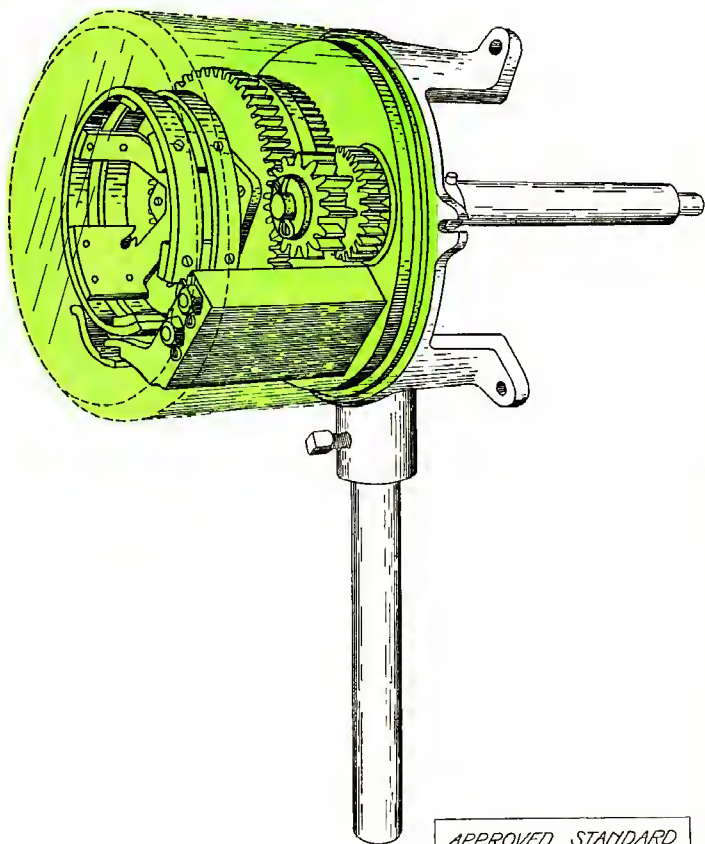
APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
Dated By: 14/11/20
Checked By: 14/11/20
Approved By: 14/11/20

SAFETY LIMIT STOPS FOR ELECTRIC CRANE AND HOISTS



APPROVED STANDARD
 WORKMENS COMPENSATION
 SERVICE BUREAU
 SAFETY ENGINEERING DEPARTMENT
 CHICAGO, ILL.
 CONSULTED BY: [Signature]
 DESIGNED BY: [Signature]

INTERRUPTED GEAR LIMIT SWITCH



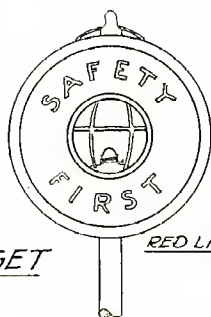
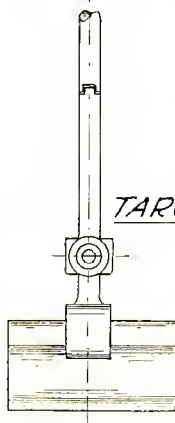
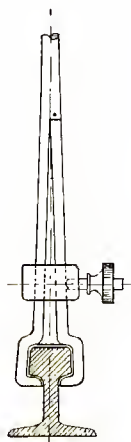
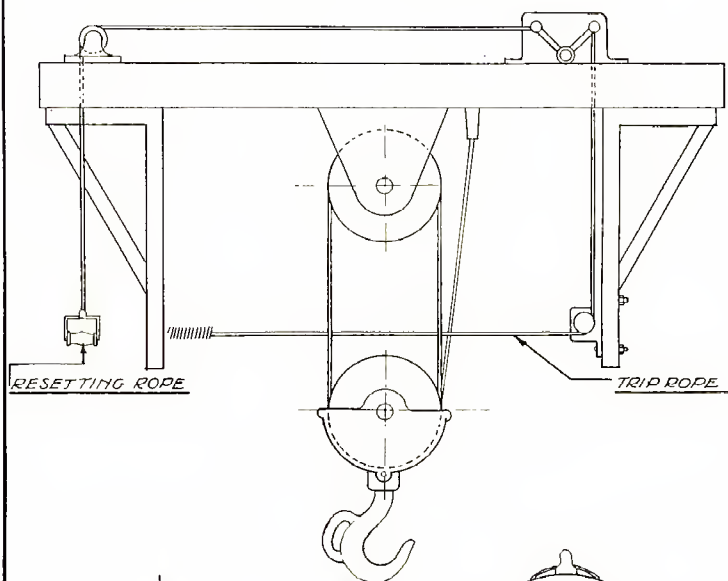
APPROVED STANDARD

WORKMENS COMPENSATION
SERVICE BUREAU

SAFETY ENGINEERING DEPARTMENT

Designed By [Signature]
Constructed By [Signature]
Approved By [Signature] [Signature] [Signature]

SAFETY LIMIT STOP *PATENTED*

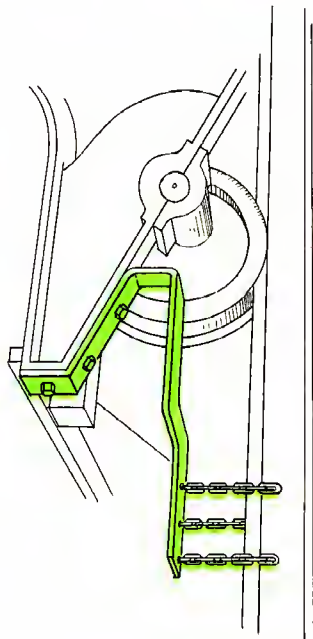


TARGET

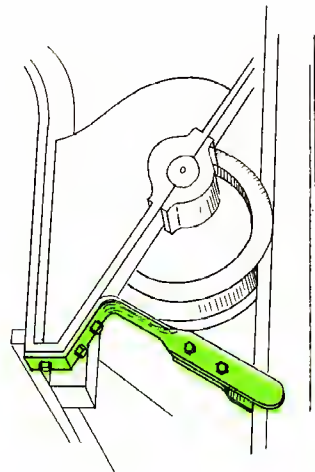
RED LIGHT

APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
 112 V
 Checked By W. J. [Signature]
 Approved By W. J. [Signature]
 Approved For W. J. [Signature]

CHAIN GUARD FOR CRANE OR TROLLEY



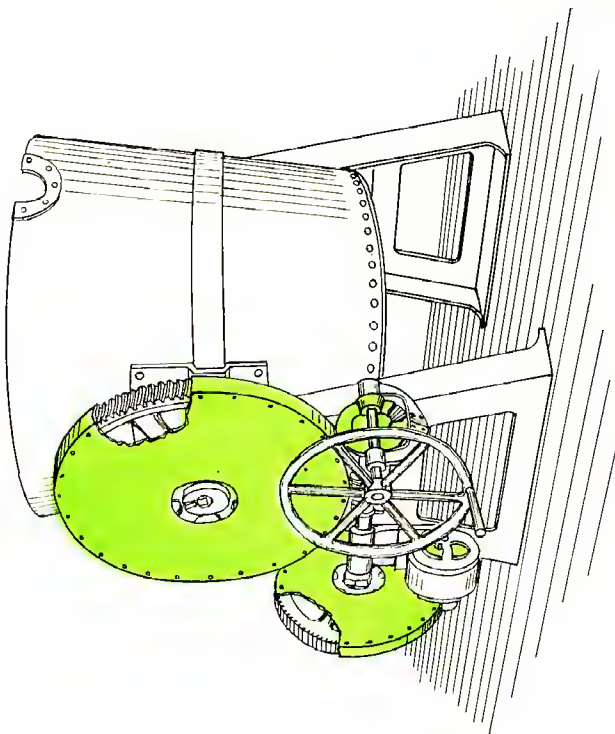
PRONG GUARD FOR CRANE OR TROLLEY



TRACK GUARDS FOR CRANE OR TROLLEY

<u>APPROVED STANDARD</u>	
WORKMENS COMPENSATION SERVICE BUREAU	
SAFETY ENGINEERING DEPARTMENT	
Drawn By: <u>H. V. H.</u>	Checked By: <u>J. V. H.</u>
Approved By: <u>[Signature]</u>	

RESERVOIR LADLE



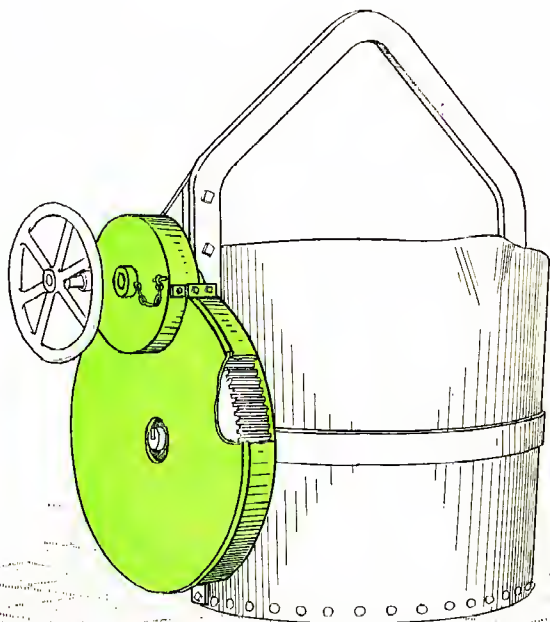
APPROVED STANDARD

WORKMENS COMPENSATION
SERVICE BUREAU

SAFETY ENGINEERING DEPARTMENT

Drawn By W. H. S.
Checked By W. H. S.
Approved By W. H. S.

CRANE LADLE



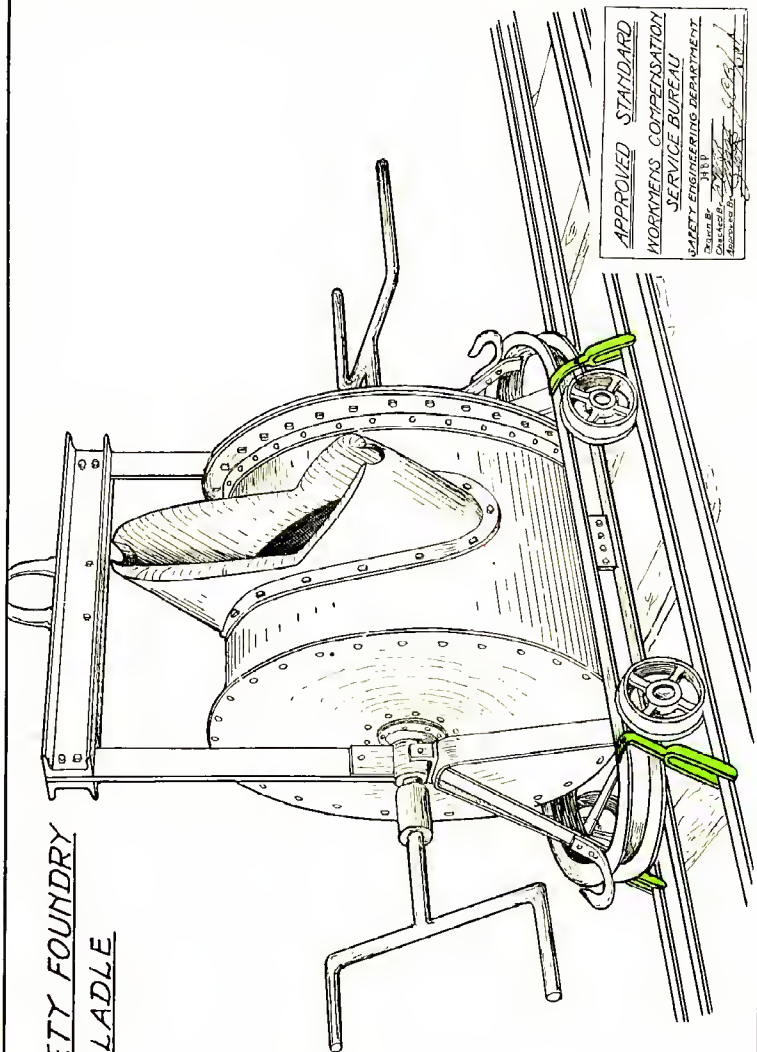
APPROVED STANDARD

WORKMEN'S COMPENSATION
SERVICE BUREAU

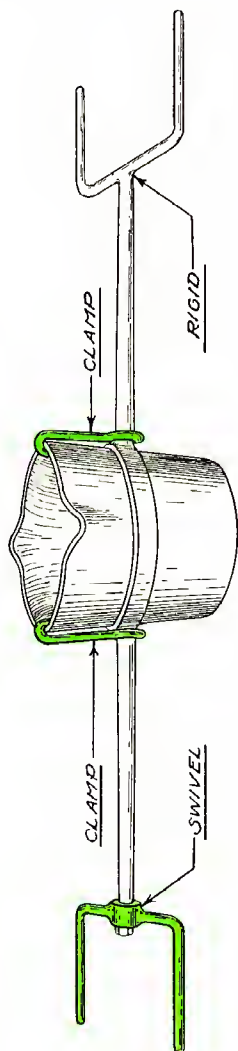
SAFETY ENGINEERING DEPARTMENT

Drawn By: J. H. V.
Checked By: [Signature]
Approved By: [Signature]

SAFETY FOUNDRY
LADLE



APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
J.H.V.
CHICAGO, ILL.
APPROVED BY: *[Signature]*



BULL LADLE

APPROVED STANDARD

WORKMENS COMPENSATION
SERVICE BUREAU

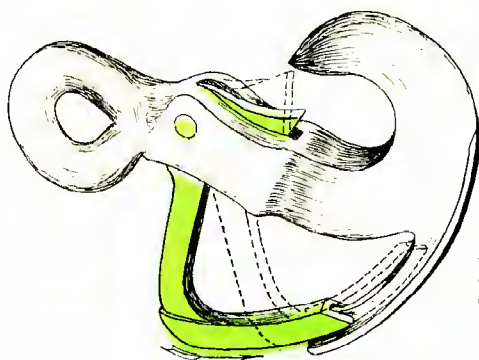
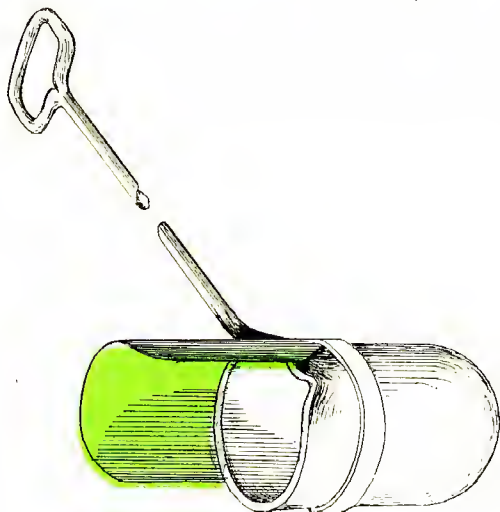
SAFETY ENGINEERING DEPARTMENT

Drawn By W. H. F.

Checked By W. H. F.

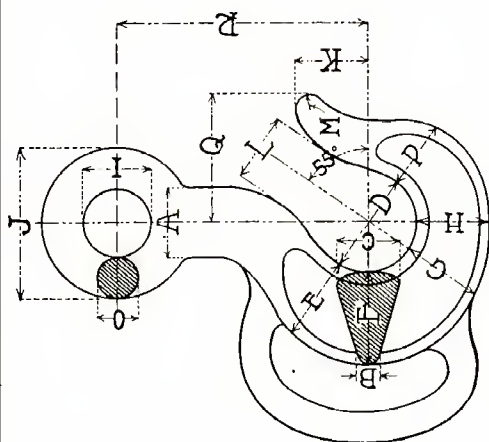
Approved By W. H. F.

LADLE SHIELD



LADLE HOOK

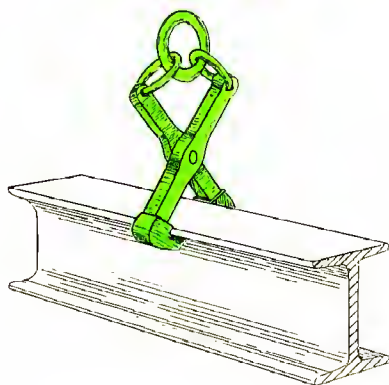
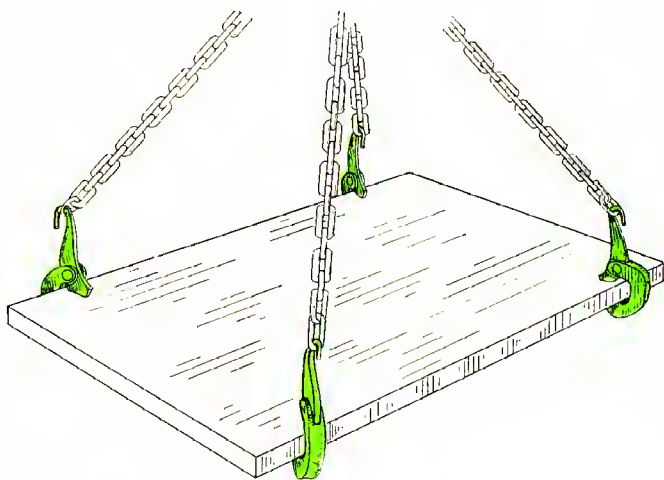
APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT.
Drawn By W. H. B.
Checked By W. H. B.
Approved By W. H. B.



HOOK DIMENSIONS

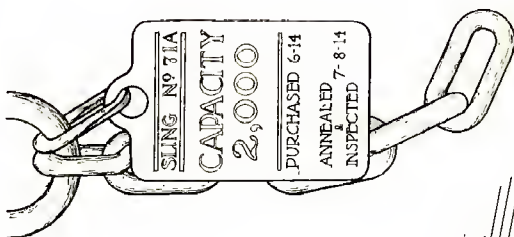
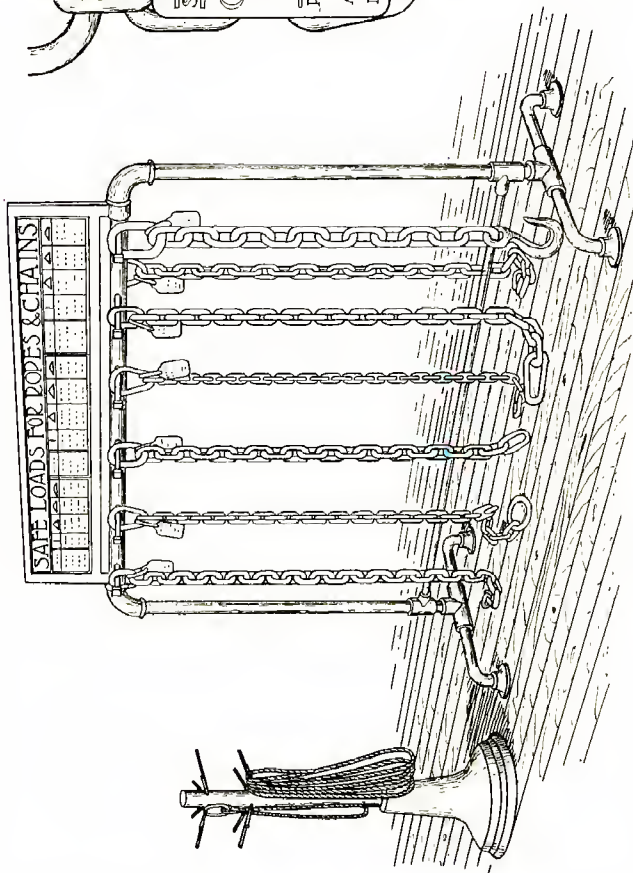
APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
COLUMBIA
UNIVERSITY
NEW YORK
APPROVED BY: *[Signature]*
DATE: *[Date]*

TONS	1	1½	2	3	4	5	6	8	10
A	1½	1¾	1⅝	1¾	2	2¼	2½	2⅝	3¼
B	17	5	11	7	1	9	5	3	13
C	15	13	13	17	13	13	21	21	21
D	13	2	2	2	3	3	4	5	6
E	15	13	1	1	2	2	2	3	4
F	17	11	13	23	21	3	3	3	4
G	13	1	1	2	2	2	3	3	3
H	13	17	1	2	2	2	2	3	3
I	1	1	1	1	1	2	2	3	3
J	2	3	3	4	4	5	6	7	8
K	13	13	1	1	2	2	2	3	4
L	15	1	1	2	2	2	3	3	4
M	1	1	1	1	1	1	1	1	1
N	13	15	1	1	1	1	1	1	1
O	13	15	1	1	1	1	1	1	1
P	13	15	1	1	1	1	1	1	1
Q	2	2	2	3	4	4	5	6	8
R	4	4	5	6	7	8	9	11	13



CLAMPS

APPROVED STANDARD
WORKMEN'S COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
 Drawn By — 1071
 Checked By — 1071
 Approved By — 1071
 Date — 10/1/11



APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU

SAFETY ENGINEERING DEPARTMENT

Division No. 1





Checked By: [Signature]

Approved By: [Signature]

SLING RACKS AND TAGS

SAFE LOADS FOR ROPES AND CHAINS (IN POUNDS)

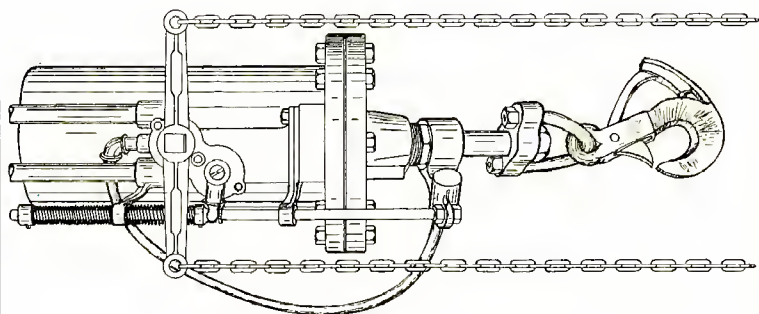
CAUTION: When handling molten metal, wire ropes and chains should be 25% stronger than indicated in table

NOTE The safe loads in table are for each SINGLE rope or chain. When used double or in other multiples the loads may be increased proportionately.			WHEN USED STRAIGHT	WHEN USED AT 60° ANGLE	WHEN USED AT 45° ANGLE	WHEN USED AT 30° ANGLE
						
PLOW STEEL WIRE ROPE <i>(6 strands of 19 or 37 wires.)</i> If crucible steel rope is used reduce loads one-fifth	DIA.					
	$\frac{3}{8}$		1,500	1,275	1,050	750
	$\frac{1}{2}$		2,400	2,050	1,700	1,200
	$\frac{5}{8}$		4,000	3,400	2,800	2,000
	$\frac{3}{4}$		6,000	5,100	4,200	3,000
	$\frac{7}{8}$		8,000	6,800	5,600	4,000
	1		10,000	8,500	7,000	5,000
	$1\frac{1}{8}$		13,000	11,000	9,000	6,500
	$1\frac{1}{4}$		16,000	13,500	11,000	8,000
	$1\frac{3}{8}$		19,000	16,000	13,000	9,500
	$1\frac{1}{2}$		22,000	19,000	16,000	11,000
CRANE CHAIN <i>(Best Grade of Wrought Iron Hand-made Tested Short Link Chain.)</i>	DIA. OF IRON					
	$\frac{1}{4}$		600	500	425	300
	$\frac{3}{8}$		1,200	1,025	850	600
	$\frac{1}{2}$		2,400	2,050	1,700	1,200
	$\frac{5}{8}$		4,000	3,400	2,800	2,000
	$\frac{3}{4}$		5,500	4,700	3,900	2,750
	$\frac{7}{8}$		7,500	6,400	5,200	3,700
	1		9,500	8,000	6,600	4,700
	$1\frac{1}{8}$		12,000	10,200	8,400	6,000
	$1\frac{1}{4}$		15,000	12,750	10,500	7,500
	$1\frac{3}{8}$		22,000	19,000	16,000	11,000
MANILA ROPE <i>(Best Long Fibre Grade.)</i>	DIA.	CIR				
	$\frac{3}{8}$	1	120	100	85	60
	$\frac{1}{2}$	1½	250	210	175	125
	$\frac{5}{8}$	2	360	300	250	180
	$\frac{3}{4}$	2½	520	440	360	260
	$\frac{7}{8}$	2¾	620	520	420	300
	1	3	750	625	525	375
	$1\frac{1}{8}$	3½	1,000	850	700	500
	$1\frac{1}{4}$	3¾	1,200	1,025	850	600
	$1\frac{1}{2}$	4½	1,600	1,350	1,100	800
	$1\frac{3}{4}$	5½	2,100	1,800	1,500	1,050
	2	6	2,800	2,400	2,000	1,400
	$2\frac{1}{2}$	7½	4,000	3,400	2,800	2,000
	3	9	6,000	5,100	4,200	3,000

PNEUMATIC HOIST PATENTED

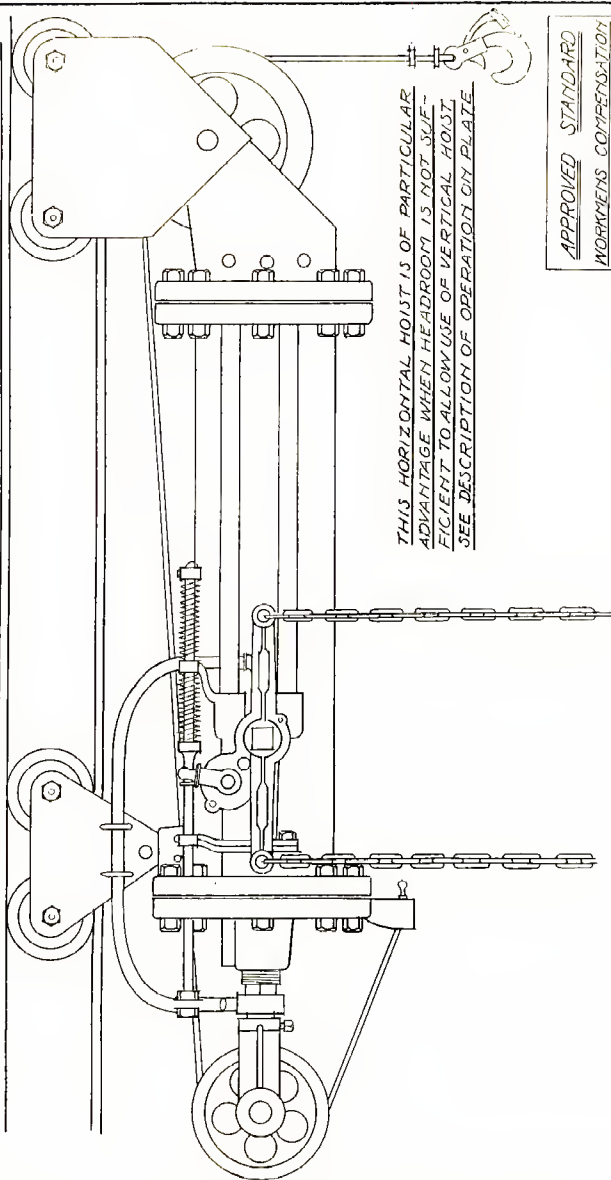
OPERATION

When load is raised and main valve closed, air passes through hose (shown in cut) and clamps auxiliary valve lever to piston rod, the slightest movement of which, due either to increase or decrease of load, or change of air pressure in cylinder automatically operates auxiliary valve and makes compensation in air pressure. Load is thus positively sustained at any desired point for an indefinite time.



APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
Drawn by W. H. B. B. B.
Checked by W. H. B. B. B.
Approved by W. H. B. B. B.

PNEUMATIC HOIST. PATENTED.



THIS HORIZONTAL HOIST IS OF PARTICULAR
ADVANTAGE WHEN HEADROOM IS NOT SUFFI-
CIENT TO ALLOW USE OF VERTICAL HOIST.
SEE DESCRIPTION OF OPERATION ON PLATE.

APPROVED STANDARD

WORKMENS COMPENSATION
SERVICE BUREAU

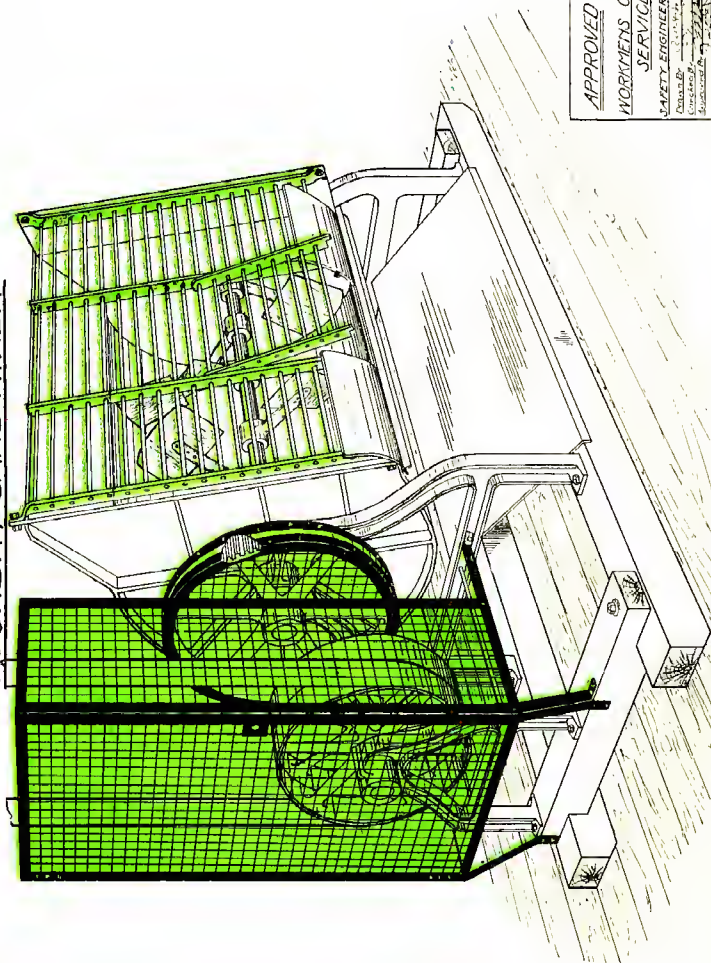
SAFETY ENGINEERING DEPARTMENT

CHICAGO, ILL.

APPROVED BY

SAFETY ENGINEERING DEPARTMENT

FOUNDRY SAND MIXER



APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU

SAFETY ENGINEERING DEPARTMENT
CHICAGO, ILL.
Consulting Engineer
6/10/27

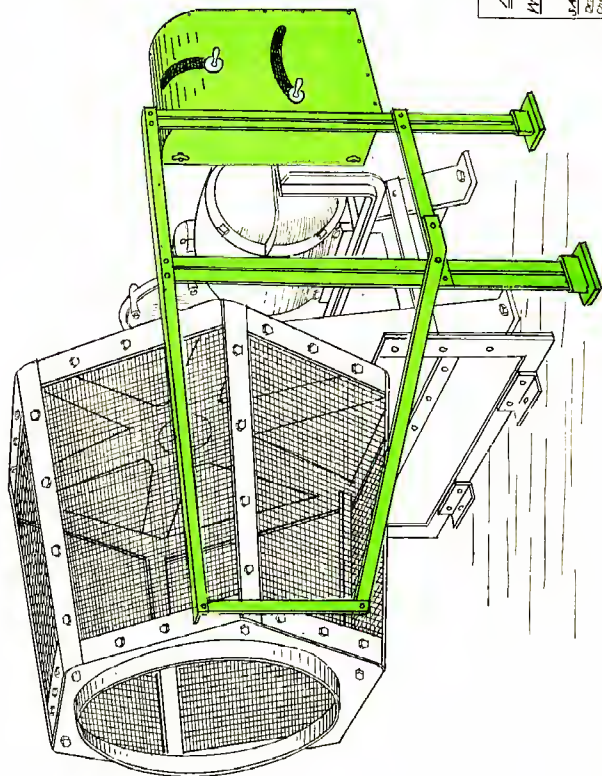
FOUNDRY MIXING
AND GRINDING
MILL

MATERIAL IS FORCED
THROUGH DISCHARGE DOOR
BY A DRAG

DISCHARGE D0000

APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
Division of Occupational Safety and Health
U.S. Department of Labor
Washington, D.C. 20340
202-201-2000

SAND SIFTER



APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU

SAFETY ENGINEERING DEPARTMENT

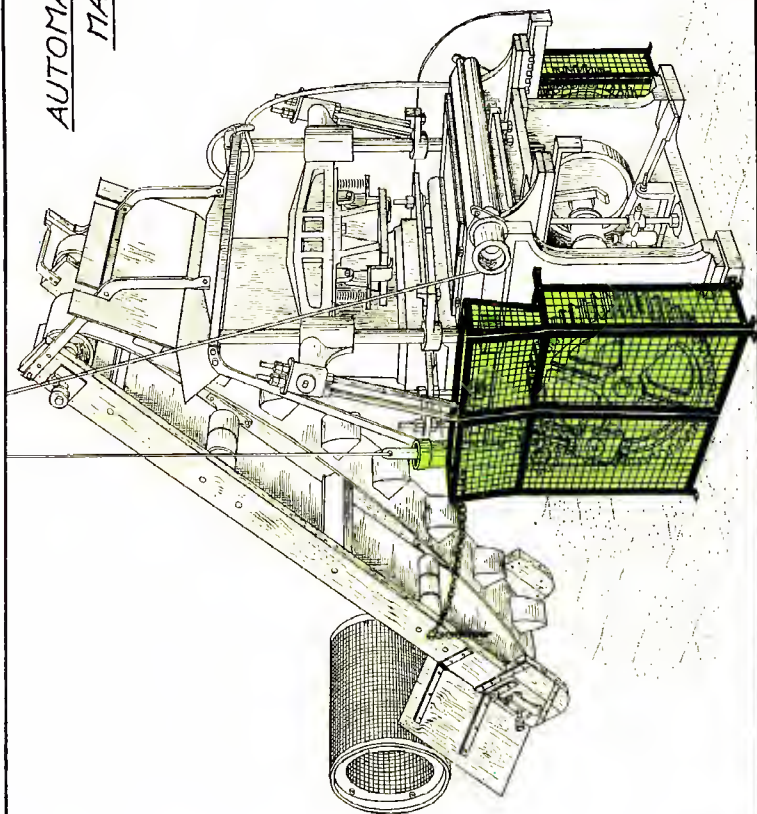
DESIGNED BY *[Signature]*

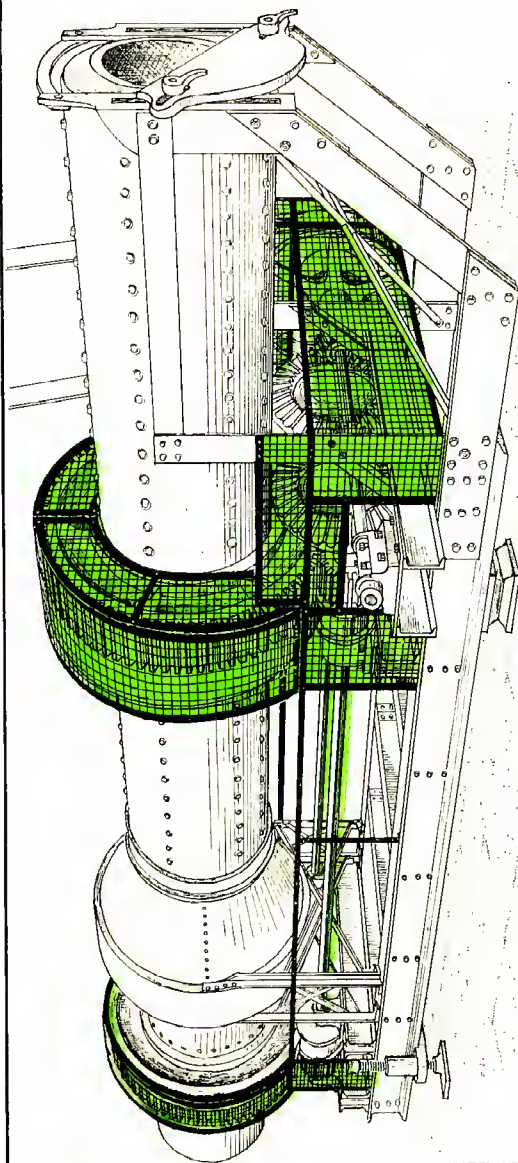
CHECKED BY *[Signature]*

APPROVED BY *[Signature]*

AUTOMATIC MOLDING MACHINE

APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
 Exam'd By _____
 Graded _____
 Issued _____
 Serial No. _____

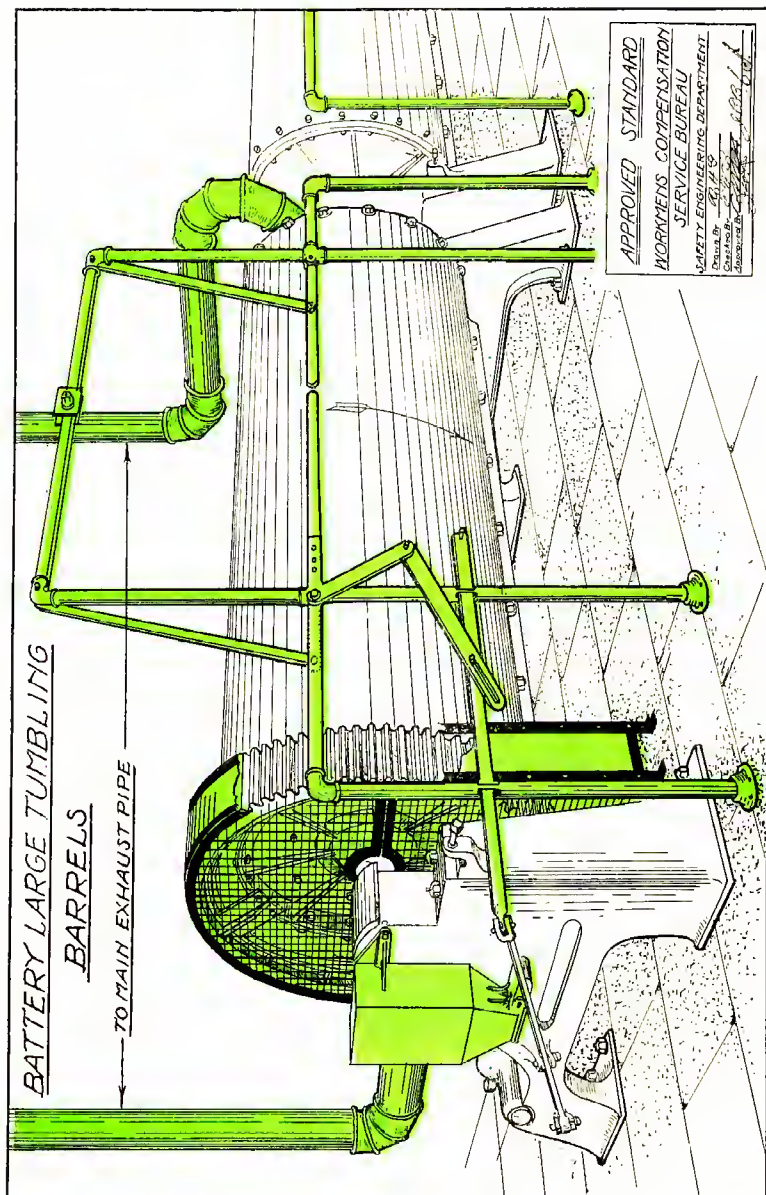




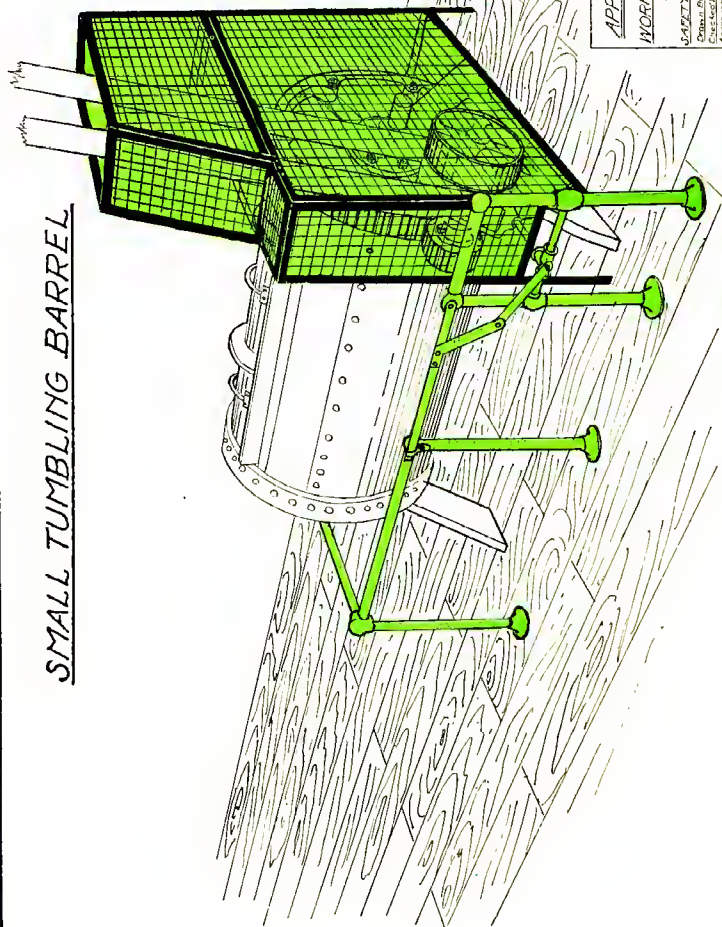
APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT

Designed By _____
 Checked By _____
 Approved By _____

CONTINUOUS EXHAUST TUMBLING MILL

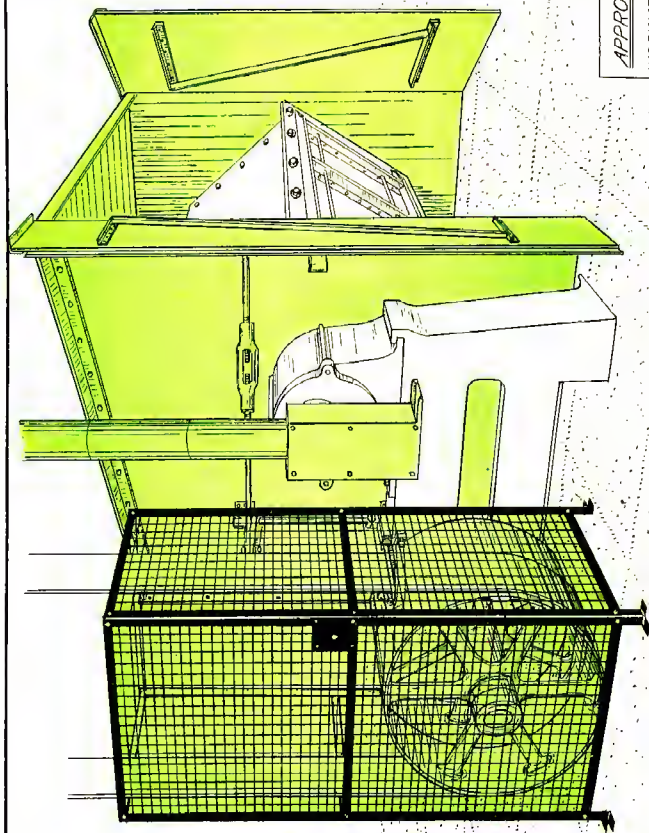


SMALL TUMBLING BARREL



APPROVED STANDARD
HYDROMENS COMPENSATION
SERVICE BUREAU

SAFETY ENGINEERING DEPARTMENT
Cotton, Tex. 77010
Case No. 10-1-2
Approved by *[Signature]* 6/23/64



APPROVED STANDARD

WORKMENS COMPENSATION
SERVICE BUREAU

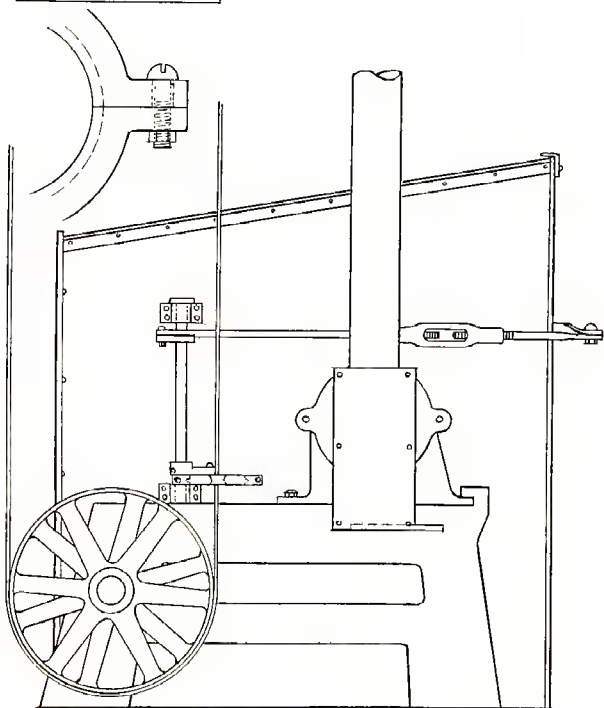
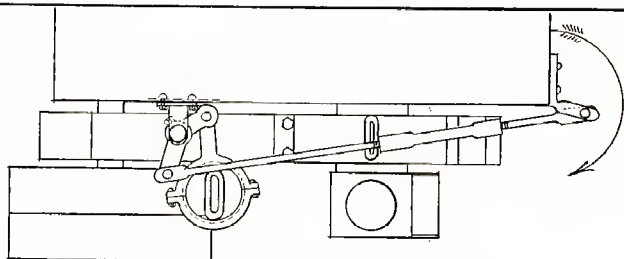
SAFETY ENGINEERING DEPARTMENT

Drawn By J. C. H. N.

Checked By [Signature]

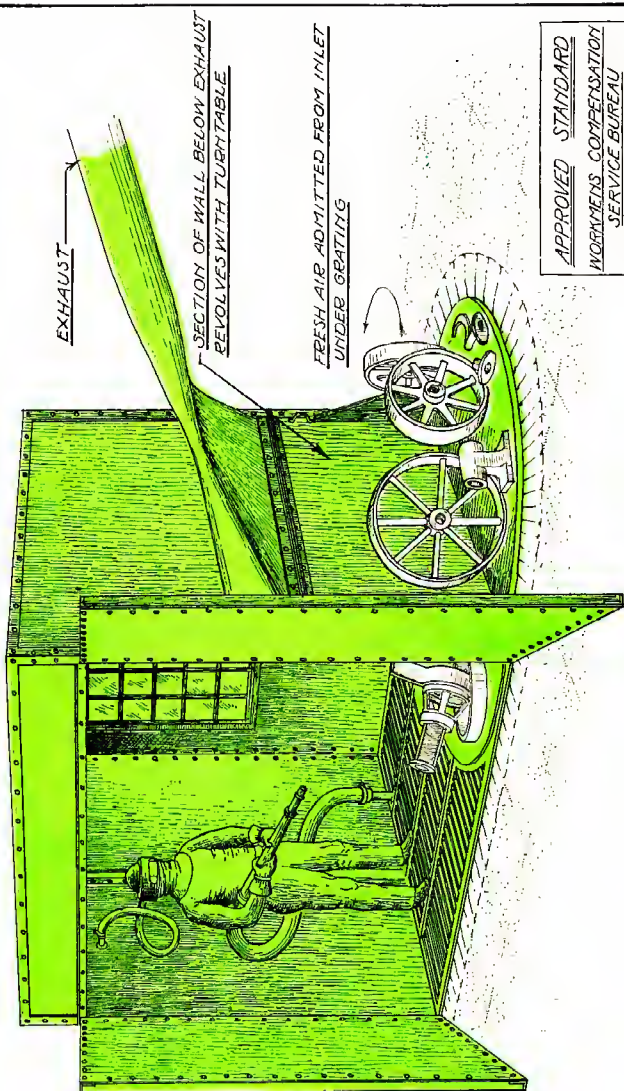
Approved By [Signature]

HOUSED TUMBLING BARREL



BELT SHIFTING DEVICE
FOR INCLOSED TUMBLER

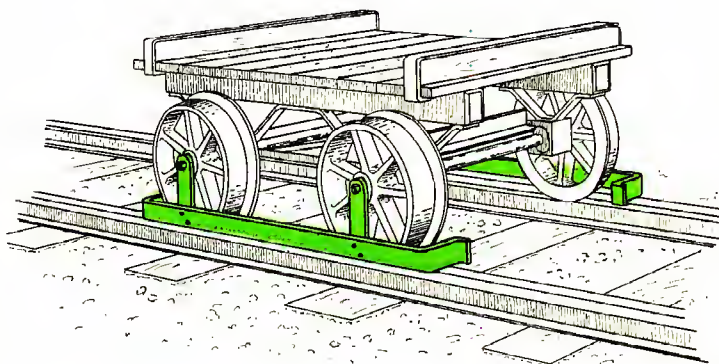
<u>APPROVED STANDARD</u>	
WORKMENS COMPENSATION SERVICE BUREAU	
SAFETY ENGINEERING DEPARTMENT	
DESIGNED BY	W. H. H.
CHECKED BY	J. H. H.
APPROVED BY	J. H. H.



SAND BLAST CHAMBER

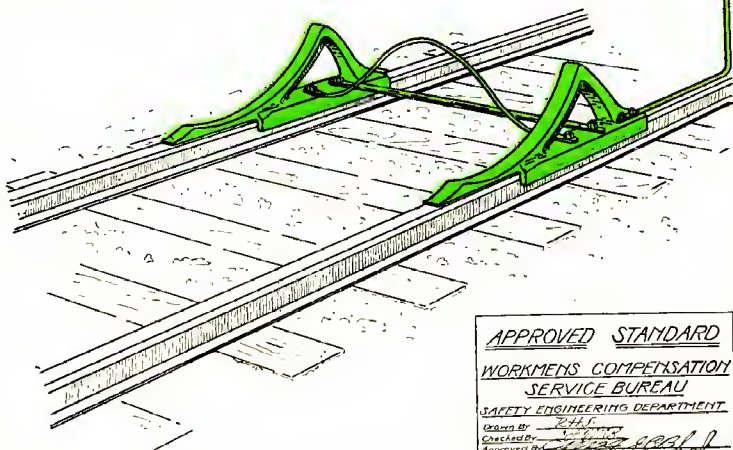
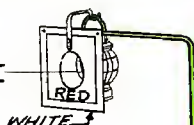
APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
CHICAGO, ILL.
APPROVED BY W. H. H. H.
DATE 1918

SHOP CAR WHEEL GUARD



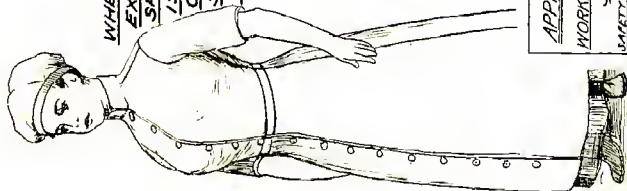
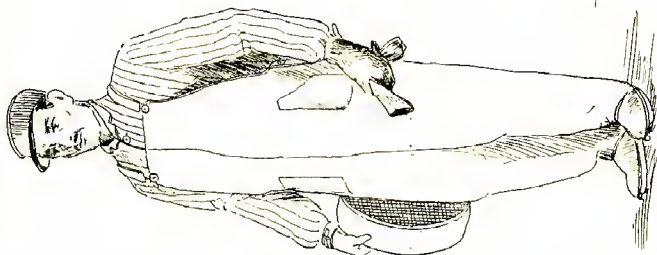
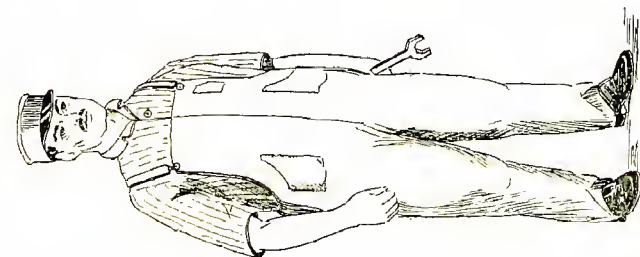
TRACK SKIDDER AND TARGET

RED LIGHT



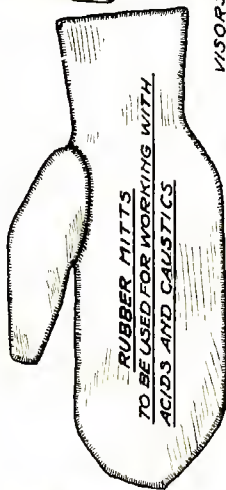
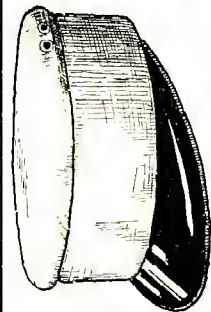
APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
 DRAWN BY W. H. H. H.
 CHECKED BY W. H. H. H.
 SUPERVISED BY W. H. H. H.

SHOP CLOTHES

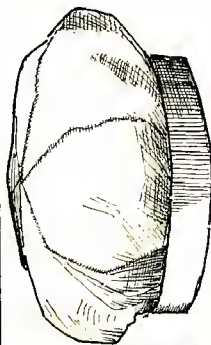


WHERE WORKER IS
EXPOSED TO FIRE OR
SPARKS, CLOTHING
IS TO MADE OF JEAN
OR SOME SIMILAR
SLOW BURNING
MATERIAL.

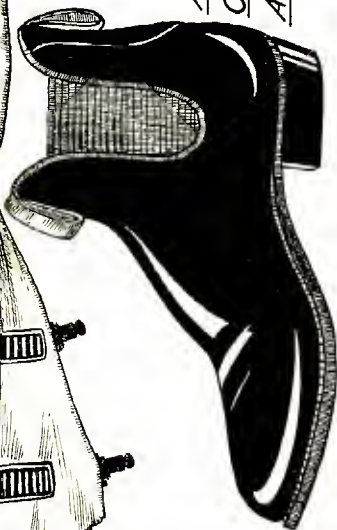
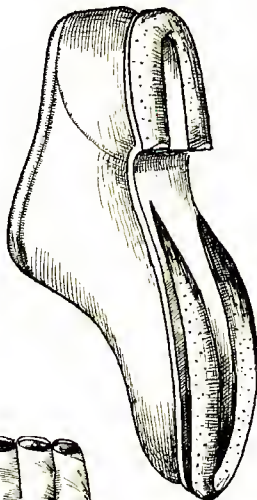
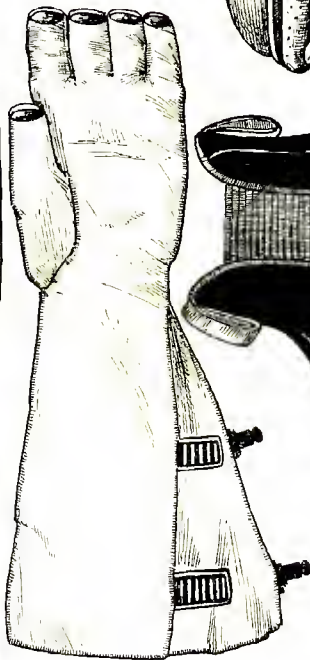
APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
Dated: 10-1-33
Checked by: [Signature]
Approved by: [Signature]



RUBBER MITTS
TO BE USED FOR WORKING WITH
ACIDS AND CAUSTICS



VISORS, GLOVES AND SHOES TO BE
MADE OF LEATHER OR OTHER FIRE
RESISTING MATERIAL



APPROVED TYPES
OF CAPS, GLOVES
AND SHOES

APPROVED STANDARD

WORKMEN'S COMPENSATION
SERVICE BUREAU

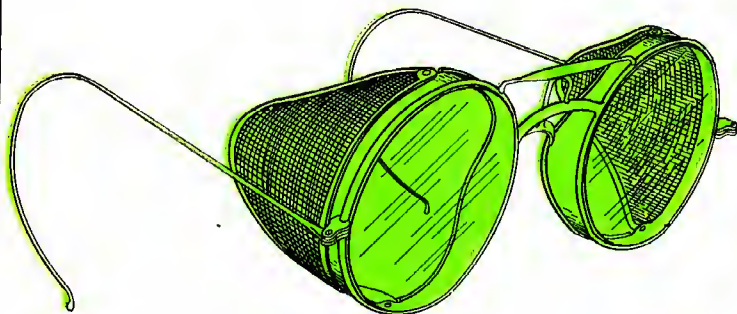
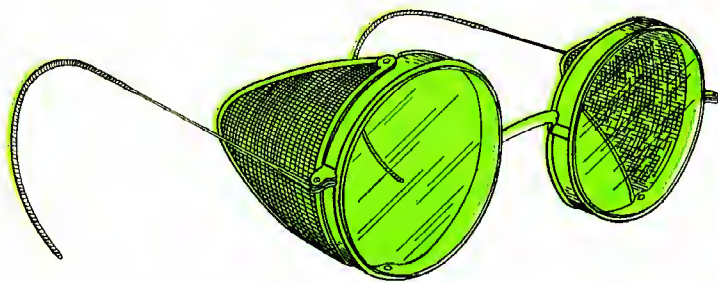
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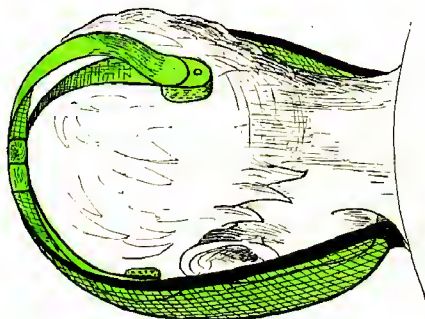
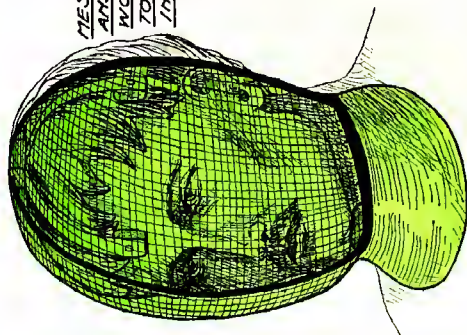
APPROVED TYPE OF GOGGLES



APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
 Drawn By W. H. H. H.
 Checked By W. H. H. H.
 Approved By W. H. H. H.

MASK

MESH TO BE 1/8 INCH OR LESS
AND TO BE SOLDERED. WHERE
WORK IS OF SUCH NATURE AS
TO REQUIRE CLEARER VISION
INSERT MICA



APPROVED STANDARD

WORKMENS COMPENSATION
SERVICE BUREAU

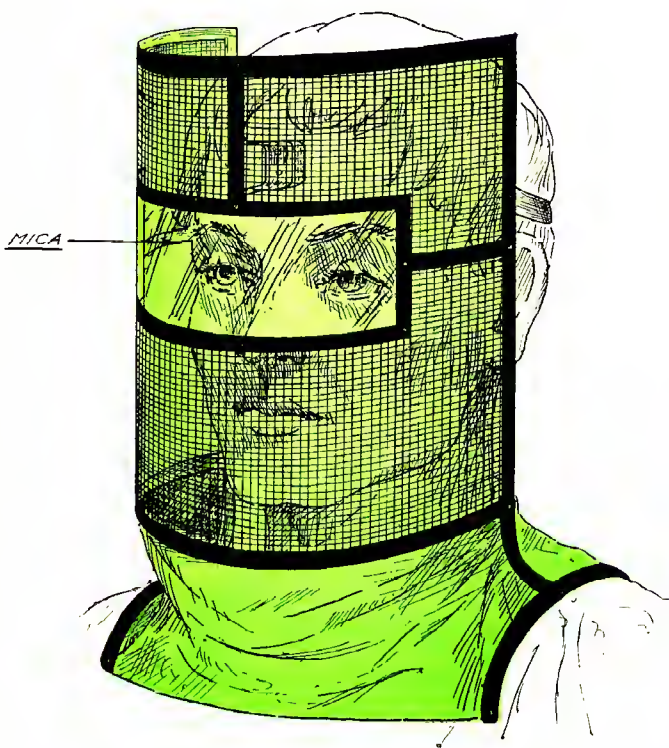
SAFETY ENGINEERING DEPARTMENT

Checked By W. H. O.

Approved By W. H. O.

Submitted By W. H. O.

FOUNDRY MASK



APPROVED STANDARD
WORKMENS COMPENSATION
SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
Drawn By D. J. S.
Checked By [Signature]
Approved By [Signature]

WELDING MASK

A LIGHT WOOLEN SKULL CAP
SECURED TO INNER EDGES OF

B LIGHT SKELETON FRAME

TO SUPPORT MASK

C PIVOTED BRACKET

FASTENED TO FRAME **B**

D SAFETY GOGGLES

USED AS EXTRA PRO-

TECTION WHEN MASK

IS RAISED

E ALUMINUM MASK

F 3 PIECES OF GLASS

1 REGULAR AKOPOS

FOR ABSORBING ULTRA-

VIOLET RAYS, 1 AUXILIARY

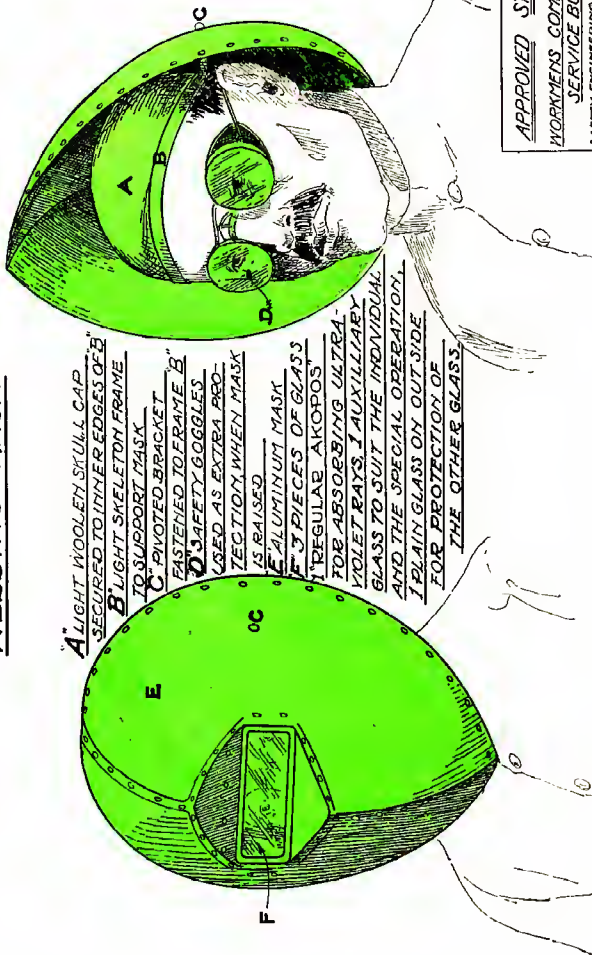
GLASS TO SUIT THE INDIVIDUAL

AND THE SPECIAL OPERATION.

1 PLAIN GLASS ON OUTSIDE

FOR PROTECTION OF

THE OTHER GLASS.



APPROVED STANDARD

WORKMENS COMPENSATION

SERVICE BUREAU

SAFETY ENGINEERING DEPARTMENT

Checked By: G. A. S.

Designed By: W. H. S.

Approved By: W. H. S.

PART IV.
SUGGESTED
RULES AND PRACTICES FOR EMPLOYEES
IN MACHINE SHOPS, METAL SHOPS
AND FOUNDRIES

TO EVERY MECHANIC:

CAREFULLY READ THESE RULES, BE SURE YOU UNDERSTAND THEM AND THEN CARRY THEM OUT IN DAILY PRACTICE

1. Cleaning and Repairing Machinery

Do not attempt to clean, adjust or repair any machinery while running. First stop machine and then make sure that nobody can start it while you are working on it. Waste and rags, as well as clothes, are easily caught in gears or other moving parts of machinery, and may draw hands, arms or other parts of the body into the machine and crush them.

2. Safety Appliances and Guards

Do not operate machine unless all guards and safety devices are in position. To operate the machine without them is dangerous. Never remove a guard or allow anyone else to do so, except for cleaning, oiling or repairing when the machinery is stopped, and then always **replace it immediately yourself.** **Do not rely upon anyone else to do it. Do not think the guard is in place—know it.**

3. Attend Strictly To Your Work

While operating a machine never engage in conversation. If someone asks a question pertaining to your work, answer without turning around if possible. If it is necessary to look away from your work, stop your machine first. If the question is not in regard to your work, pay no attention to it and do not answer.

4. Emery Wheels

Do not operate an emery wheel without protection for the eyes. Do not operate an emery wheel faster than the speed recommended by the manufacturer. Be sure that the speed is right before mounting wheel.

Be sure the tool rest on the emery wheel is not below the center of the wheel and have the rest as close to the wheel as possible. Wheel should be running true and without vibration. If not, call attention of foreman and have wheel fixed before operating.

Be sure that your wheel is running at normal speed before starting to grind.

Always keep bearings of grinder well supplied with oil. A hot arbor may expand and break wheel.

5. Ropes and Slings

Always carefully examine slings whether of wire, manila rope or chain. Be sure there are no defects anywhere.

Where it is necessary to sling a piece of machinery around sharp corners, always protect the rope from being cut by using chafing gear. Usually old sacks or rags are provided for this purpose.

When using chain slings, examine them carefully to find broken, cracked or worn links, and make certain that the rope or sling to be used is of sufficient strength to carry the load intended. **Never take a chance thinking it is all right – make sure that it is.** (See table Page 271.)

When through with sling, return it to rack where it belongs.

6. Crane Operators

Always open and lock main switch before leaving crane cage.

Before any repair is undertaken on trolley, top of crane or runways, open and lock main switch in cage and safety switch on top of crane and make sure that all persons are off crane and runways before closing switches again.

Keep crane and machinery clean, well oiled and in good working order. Report to repair man any defects which you cannot remedy.

When crane is down for repairs, assist repair man. After completion of any job make sure that bolts, tools, etc., are removed.

Make sure before starting to hoist that hooks and slings are securely fastened on material and ladles.

Do not move load without signal from proper man.

Under no consideration permit your crane to bump into another crane.

Do not allow men to ride on load carried by crane, or on crane hooks. Refuse to move until they get off.

Before starting to hoist, place the trolley directly over the load to avoid swinging the load against workmen.

Examine your crane every day for loose or dangerous gears, keys, ladders, runways, railings, warning bells, signs, switches, sweepbrushes, cables, brakes, etc., and make a written report on the form provided when you go off duty showing the condition in which you leave your crane.

Do not fail to report anything that is out of order.

Hookers should walk ahead of loads carried by cranes, and warn men on the floor to get out of the way of the load.

7. Notify Foreman When Machine is Out of Order

If your machine fails to work properly, notify your foreman at once. Under no circumstances try to experiment, if you do not understand the mechanism of your machine, admit it and get instruction.

8. Care To Be Used On Drill Presses

Do not attempt to hold a short piece of iron by hand while drilling it. Use the vise provided, or secure it by clamping it down on the table.

9. Care To Be Used On Lathes

Remove chuck wrench immediately after having placed a piece of work in the lathe. If work being turned is of an irregular shape, as for instance, a crank shaft, eccentric or the like, be careful, and if practicable place a cover over the projecting parts.

Do not attempt to put a heavy chuck, jig or piece of work in the lathe without crane, hoist or tackle. Always make sure that the work is thoroughly secured and centered in chuck or between the points before you start turning the power. Before starting always turn your lathe a complete revolution by hand to make sure that the work and clamps clear the bed.

Do not attempt to take too heavy a cut or use too high speed. It may throw the work out of the lathe. Always make sure that the tool is not too low. Do not put your hands or fingers on a revolving piece of work. A small cut received in this way is painful and may result in blood poisoning.

10. Chipping

When chipping cast iron or other metal, always chip in such direction that chips will not injure your fellow-workmen. If the work necessitates chipping in any direction where other men are working or likely to pass, use a shield. (See Page 238.)

11. Handles On Tools

Do not use a file without a handle, and always keep the handle tight.

Handles of hammers, sledges and other tools should be kept tight and sound and free from splinters and all other defects.

Do not use a chisel, drift pin or other tool with the head burred. When burrs begin to develop have the head ground.

When dressing tools, dress both ends and be careful that the head is not brittle.

Brittle tools are not to be used for hammering.

If pieces or slivers fly from hammers or heads of chisels and similar tools, discard the tools or have them annealed.

12. Piling Material

When piling castings, machinery, patterns, moldings, boxes, flasks or other material be sure to do it in such a manner that the pile cannot fall or slide down.

Be sure in loading material on a truck that the load is so secured that it cannot fall off when carried through the shop.

When stacking iron or brass bars or pipes, give them the proper slant and secure them at the bottom to prevent sliding and on the sides to prevent falling. (See Page 235.)

13. Working Overhead

When working overhead, be sure that scaffolding is safe. Always notify men working below before you go aloft. If necessary to work above other men, fasten wrenches, hammers and other tools with a strong line and keep them in a secure place. Place danger signs at all approaches. (See Page 108.)

14. Keep Passageway Free

Do not allow material to be piled around your machine.

Keep passageway clear for a sufficient distance to allow yourself room to work and to enable other men to pass without stumbling.

15. Clothing

Do not wear loose, baggy or torn clothing.

Always wear your overall coat inside your pants.

When working on lathe, boring mill, grinder, milling machine, drill press, or other revolving machinery, always roll up your sleeves, or better still, have your sleeves cut off above the elbow and close fitting. (See Page 285.)

Do not wear gloves when operating machinery.

When wearing gauntlets or gloves around hot metal, they should be tight fitting around wrists and your sleeves should extend over them.

When working in foundry or around hot metal of any kind, it is particularly important to keep clothing below the knees in good condition and without folds, holes or loose parts in which hot metal may catch. Use clothes made of jean or some similar slow-burning material when exposed to hot metal or flame.

Use Congress shoes only. (See Page 286.)

Use leggings inside of pants.

Do not wear rings while you are working. Many fingers have been lost on account of rings catching on projecting points of machinery or work.

16. Care of Ladles and Skimmers

Do not use a ladle until you are satisfied that it is absolutely dry. Do not fill a ladle too full.

17. Catching Iron from Cupola

When catching iron from cupola, always cut the stream from the front toward the furnace.

18. Pouring Metal

When pouring metal into moulds, keep feet away from mould and from under ladles and stand so that it will be easy to move quickly if hot metal should break through.

Be very careful when pouring hot metal or slag on the ground to be sure that the ground is free from moisture as even slight dampness may cause a serious explosion.

19. Gangways

Do not leave any weights, boxes or other material in a gangway, where men carrying hot metal may stumble over them.

Men carrying ladles have the right of way.

Do not try to pass them in a narrow passage.

20. Repairing Cupolas

Before entering the cupola to repair lining or do other work, place a danger sign on the charging door and have the door closed or a screen placed in front of it so that no one will drop material upon you.

21. Report Every Injury

Always report an injury, no matter how small. A slight scratch or cut may result in blood poisoning if not given the proper care.

22. Playing During Working Hours

Never jostle, fool or play tricks on a fellow workman during working hours. It distracts his and your attention from work and very often results in serious and even fatal injuries.

23. In General Observe This

Never expose yourself or others to any unnecessary dangers and remember these instructions are meant for **You**. If **You** follow them, **You** will be the beneficiary. **Therefore, for your own sake follow them.**

24. Special Notice

If you are suffering from apoplexy, cramps, fainting spells, dizziness, partial deafness, short-sightedness, hernia, varicose veins, or other physical weakness or defects not visible to the eye, give immediate notice of such defects to your Foreman or Superintendent and he will not put you to work any place where there may be special danger of you getting injured.

The use of intoxicants on the work premises or during working hours or the use of intoxicants to excess off work premises at any time, should and no doubt will be deemed sufficient cause for immediate discharge.

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